Educators' insights on utilizing iPads to meet kindergarten goals

by

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Abstract

This study investigates how educators plan and review the integration of iPads to meet Early Learning Kindergarten curriculum goals across the four newly-established domains of the Ontario Kindergarten Curriculum. The literature reviewed for this study indicates that earlier studies on iPads have primarily focused on measuring literacy and mathematics learning outcomes and little research has been done on how technology can be used in a play-based learning environment. This study explores other domains of Kindergarten iPad use which are less documented in the literature. The study captures teacher planning for iPad integration to help students meet outcomes in other domains (such as Problem-Solving and Innovating; and Self-Regulation and Well-being). This study follows an action research model and captures the conversations of two educators implementing iPads who set goals (plan) and document their reflective practice through recorded conversations at regular intervals. Results of this study suggest that iPads can be used to develop skills in all four domains of the curriculum and that iPads can be used as a tool by teachers to document learning in a play-based environment. Our findings indicate that when teachers engage in action research, they are able to reflect and improve upon their own practices. As teachers develop new pedagogical understandings about the relationship between iPads and play, they are then able to support students' digital play.

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1 Introduction

In grocery store lines, sitting in the backseat of a car, or waiting at the doctor's office, it is common in Canada to see a young child playing on an iPad. As the popularity and accessibility of technology have increased, so has its use by young children. A study of how children under five interact with digital technologies at home indicates that children under five use many different digital technologies (Palaiologou, 2016). By the time children enter Kindergarten, many are aware of the technology in their environment and its applications, and have already developed skills using technology (Plowman, McPake & Stephen, 2008). In Palaiologou's (2016) survey of parent views of technology use, parents agree that technical literacy is an important skill that their children need to be literate in the 21st Century. Some Kindergarten classrooms are now trying to keep up with this trend, and are integrating iPads into their classroom practices.

Schools adopt technology to differing degrees which may be dependent on available funding and the relative importance placed on technology in student learning. Blackwell, Lauricella & Wartella (2014) find that technology is generally under-used in primary classrooms. In Kindergarten, schools need to also consider which types of technology will best suit young learners. Navigating a traditional computer with a (QWERTY) keyboard is often difficult and requires intensive teacher assistance for Kindergarten-age children but the touch-screen interface of the iPad makes it a much more user-friendly option for young learners (Neumann, 2014). It also makes learning management easier for teachers because children can navigate the technology more

independently requiring less technical support from the teacher, who can then focus on what students are learning on the devices.

This study takes place in Ontario, Canada and it examines the process of two kindergarten educators who are seeking to identify how iPads can be used to meet learning goals with the curriculum for Ontario, Canada which is provided by the Ministry of Education, Ontario (OME). The new Ontario Kindergarten Curriculum program has shifted from an older, more traditional pedagogy to one that has a more child-centred approach and includes the integration of technology in the classroom (OME, 2016a).

Research to date on technology use in kindergarten has been mostly positive (e.g., Miller & Warschauer, 2014; Neumann, 2014). Most research on iPads and early learners to date has focused on iPad use in language learning (Beschorner & Hutchison, 2013; Neumann & Neumann, D., 2014; Neumann, 2014). Multiple studies have found that using iPads helps students to develop literacy skills such as learning about reading print, printing letters, and phonemic awareness (Beschorner & Hutchison, 2013; Neumann & Neumann, D., 2014; Neumann, 2014). Applications such as digital books give children different types of literacy experiences and increase engagement with print (Miller & Warschauer, 2014). Studies on the success of mathematical Apps as a tool for improving numeracy skills report positive results (Schacter et al., 2016; Zaranis, Kalogiannakis & Papadakis, 2013). These studies for the most part indicate that iPads have a positive impact on both literacy and mathematics for young children.

The curriculum in Ontario has shifted, however, from subject-based into a more holistic view of learning, and early childhood educators need to consider student learning in the other domains of the Ontario Curriculum such as “Belonging and

Contributing", "Self-Regulation and Well-Being" and "Problem Solving and Innovating" (OME 2016a, p.14). According to the new Kindergarten curriculum, learning tasks need to be empowering, play-based and individualized to apply to each student's unique interests and allow each student his or her own creative voice (OMEa, 2016).

1.1 Overview

This research project explores how teachers can use iPads to create learning tasks for students to meet Early Learning Kindergarten goals across all of the four domains; demonstrating literacy and mathematics behaviors; problem solving and innovating; self-regulation and well-being; and belonging and contributing (OME, 2016a). As such, it fills a gap in the literature because no research has been located which shows iPad use across these four domains of early learning.

1.2 Purpose

This research follows the learning journey of two experienced Kindergarten teachers as they investigate using iPads in their classrooms to meet Early Learning Kindergarten learning goals. The teachers, including the researcher as one of the participant teachers, engage in collaborative learning following Creswell's (2012) definition of "teacher action research" which is a purposeful examination of teacher practice to improve teacher performance and student learning. Funding for materials and supply teachers for this project was provided by the Ontario Teachers Federation (OTF) through a grant for teachers wanting to drive their own learning through action research. The teachers purchased five iPad minis, protective cases, speakers and iTunes cards which were shared between the two classrooms.

The study took place over several months. The teachers met in at the end of November, 2016 for the first time to discuss their planning and reflections about technology use in the classroom, collecting data on the project. During the first meeting the teachers engaged in discussions about specific questions related to the study. These questions focused on answering the larger research question:
"How can teachers use iPads to meet Early Learning Kindergarten curriculum goals across the four domains of the new curriculum?"

The teachers met two more times over the ensuing months. Each time, their meetings were recorded and then analyzed as a whole to determine the findings of this study. The findings overall indicate that iPads can be used to support learning across all four frames and children learn with iPads through play. In addition, reflecting upon student learning through documentation and discussing with another teacher helped the educators to gain greater insight into how children learn with technology. A discussion and recommendations chapter offers some interpretations and comments on the findings. The study concludes that iPads can be used to support student learning in kindergarten across multiple domains and that this is an emergent area of research that warrants further investigation.

2 Method

The methodology chapter is written in the first person because in this way I will be better able to capture my journey to complete this research project as the culmination of my Master of Education program at UOIT.

Evolution of my research question

Because my research is action research, my experience as a classroom teacher and technology implementer is important. I have been a classroom teacher for thirteen years and have seen iPads and iPods make their way into the schools in which I have worked. I first had access to a school iPod for use as a teacher four years ago. At that time, I had not seen students interact with this technology though I had frequently used my own personal iPad to present information to the students in the years prior. I also have my own personal experience of having a young child who has had an iPad in her household since she was born and learned to use it from a very young age. When I moved to my current K-8 school, I was hired because of my background with technology as part of the UOIT Master's Program. In this position I had access to a set of ten iPods belonging to the school to use for teaching. The school also had several iPads and I was able to observe teacher use of these devices. The last two years I have spent teaching Kindergarten, and both myself and the other kindergarten teacher have had access to two iPads and five iPods.

Research Design

In April of 2016, I applied for a grant from OTF for a program called Teacher Learning Coop (TLC). The TLC was created by OTF so that teachers could pick their own teams of teachers, identify an action research project that they would like to work on, conduct research and evaluate the effectiveness of the project. This type of

research can be defined as action research where educators use the inquiry process to challenge their own practices (Brydon-Miller, Greenwood & Maguire, 2003). In action research, the researchers hold the view that individuals in a community are competent and often best suited to address and find solutions to issues that arise within their communities as opposed to only placing power to do research in the hands of the "experts" (Brydon-Miller et al., 2003). The grant provided funding for supply time for my teaching partner and I so that we would have time to discuss the use of the iPads, as well as the funds to purchase iPads and accessories.

I applied as the project leader and my teaching partner agreed that she would like to be the other team member. Our goal for the project was to investigate how kindergarten teachers can best utilize technology in kindergarten. This was, in part, driven by the changes with the new Kindergarten curriculum and its focus areas of inquiry and play-based learning. My particular interest in this project was the use of iPads. In my observations of iPad or iPod use in the classroom prior to this study, the iPads were peripheral to the learning outcomes of the class. For example, I have observed that iPads were used to placate students who have behavioural challenges or for students who were finished their work and had nothing to do. In these instances, the teachers did not seem to have a lot of interaction or knowledge about what was on the devices nor were they integrated into the learning of the classroom. This made me question the use of the iPads as it seemed as though there was a better way to utilize these devices for student learning. Shagoury and Power (2012) would describe this frustration with the way we see things done or are doing them and what we feel should be happening as *tension*. It motivates us to ask questions to gain more understanding

about the situation in order to improve it (Shagoury & Power, 2012). I felt that, with a formal study, I would like to have more time to improve my own practices using iPads in my classroom. This was an opportunity to explore this in more depth and to specifically explore how iPads can be best utilized within this early years setting.

When our research was approved and we were chosen for the grant in June of 2016, I was also exploring the idea of doing a Master's research project. As my supervisor and I discussed my research interest in iPad use in kindergarten and the grant I had already secured with OTF, we decided that this would be an opportunity to delve more deeply into this research as my master's project. We discussed the different types of research but because the grant was set up as teacher research on practice, or *action research* (Creswell, 2012), this seemed like the best fit.

According to Creswell (2012) action research aims to solve specific problems that arise within practical situations. Action research is conducted by teachers or others within educational settings to address specific problems that they encounter. Educators collect data through various methods that may be qualitative or quantitative research. They then reflect upon the data and implement change based on the findings. As a result, often changes can improve the educational organization or setting. Action research provides an avenue for educators to examine issues related to their unique situations and is designed in a way that fosters collaborative learning amongst stakeholders and researchers. Through action research, educators engage in a dynamic process moving between collection of data, reflection and action. This process does not occur in a linear order (Creswell, 2012).

I also had always had an interest in doing qualitative research and I was interested in doing action research because it is a type of research that gives voice to teachers who may not always be heard in decisions that get made by policymakers. Ruddock and Hopkins (1985) described the difference between a teacher-researcher and a large-scale educational researcher like the difference between a large scale agricultural business and a backyard gardener. To the large-scale agricultural business as long as crops are favourable overall, they do not care if individual plants succeed, whereas to the attentive gardener caring for his/her backyard garden, each and every one of those plants success matters and each can be treated differently based on its needs (Ruddock & Hopkins, 1985). This was significant for me as a teacher-researcher because I knew that what my teaching partner and I might find could be different than what would be found in another class based on the variables of each learning environment. I also had found very little research that dealt specifically with challenges to Ontario teachers and I hoped that this research would give ideas to kindergarten teachers in my community, myself included, and strategies to most effectively use iPads in play-based kindergarten settings to meet the goals of the new curriculum. I also felt that research conducted by a kindergarten teacher who understands the complexities the classroom would provide helpful insights for teachers. Since action research is an effective method of creating change in the educator's own practices as well as organization and community practices, this seemed to be a good fit (Brydon-Miller et al., 2003).

Getting Approval to Conduct Research

My academic supervisor and I worked together to create my first Research Ethics Board (REB) application to the University of Ontario Institute of Technology (UOIT) REB which was submitted at the end of August, 2016. This application included the consent form for my teaching partner to participate in the study (Appendix A). Two weeks later, we were asked to add more detail to the REB and resubmitted at the end of September. During this time, I had also submitted an application to do research to the district school board for whom I teach. We were unsure if they would need a formal application because I was doing action research but when we inquired, we found that I was required to do this. This application would be reviewed by a committee at the district school board. Once this application was submitted, my contact at the board suggested that I add more detail to my application as the board would be meeting at the beginning of October and if my application was not approved I would have to wait until the next meeting which would be a month later. He gave specific areas that I needed to add more detail and also advised that I incorporate more language about the board's interests such as the board improvement plan and the Ministry of Education documents. I did this and my application was approved by the school board pending consent from my principal, which had been obtained prior to the board application being submitted.

I had hoped to start my research in mid-October when the school board application was approved. Unfortunately, because the REB application at the university was not yet approved, my teaching partner and I used the time to purchase the iPads, iTunes cards and figure out what type of covers to get for them and get them set up for use.

During this time period, I worked extensively on my review of the literature, focusing on how iPad use in kindergarten had been researched. I also examined

Ontario curriculum policies to determine their direction for using technology in the early year's classrooms. As time went on and I became increasingly worried about the limited time I would have to conduct research for this project. My supervisor and I contacted several different people within UOIT including the REB to figure out what was happening with my application. Finally, at the beginning of November, I was told that someone had dropped the ball on my application and that it would be looked at soon. A week later my REB application was returned to me with further clarification needed. The reviewer was concerned about the impact of my study on the students in both classes. We clarified that we were not interviewing the students for the report, would not use any student names and would discuss our observations of what our students were doing, as we would normally as teachers. I also consulted someone at the UOIT REB to get clarification about the concerns of the reviewer. The application was quickly revised and sent back again to REB within a couple of days. At the end of November I was informed I that my research would be approved if I created a consent letter to send home with all of the students each both classes.

Because time was of the essence and if the REB process took any longer the research project may not have been able to occur within the program timelines, I quickly made up a consent form and emailed it back to the REB (See Appendix B). I got approval days later and my teaching partner and I quickly sent home forms to our students. Most students returned their forms, so we decided that any details about students without consent would be taken out of the recording. Fortunately, student names were rarely mentioned in our discussions and we spoke more generally about students so this wasn't an issue.

2.1 Procedure

Session 1

My teaching partner and I met immediately after REB approval at the end of November. We discussed several questions that I had created for session one about how we had used IPads in our classrooms to date and our goals for this project (Appendix C). This discussion was recorded using my iPhone recorder as well as a handheld recorder. This was to ensure that if there was an issue with one technology there was a backup. Each session lasted up to two hours.

We had already been using the iPads in our classrooms but it had been mostly for ourselves as educators for assessment. We already had two iPads that the school had purchased in our classrooms and then with the additional five iPad minis we had purchased we had a total of nine. We decided to use two of the new iPad minis in each of our classes for documentation and assessment. My Early Childhood Educator (ECE) partner and I, whom we will call *Class 1* for the purposes of this study, had already been using one iPad for this purpose for the last year. We had created a notebook in Microsoft OneNote with tabs for each child and within each child's tab a page for each learning domain. We add PicCollages, photos, text and audio recordings and this is where we recorded student development in each of the four domains. We also used an app called Remind to communicate with parents as well as Sway to create documentation panels of student learning.

My teaching partner and ECE, who for the purposes of this study we will call *Class 2 teacher and ECE*, were new to using this program but interested in learning more

about how to document using the iPad. Teacher 2 already had an existing method of keeping records of student progress but because of the availability of iPads and encouragement from our administration to use OneNote for student documentation, she was open to learning about this process.

Because of our desire to explore different ways of using iPads including guided groups, we decided to share the five remaining iPads between the two classrooms. We tried to have an *every-other-day* schedule but ultimately realized that using them in Class 1 in the morning and Class 2 in the afternoon would be the best solution. We chose a couple of apps to use initially. One was *Handwriting Without Tears*, which was an app to help students develop printing skills. This included printing uppercase and lowercase letters and numbers. We identified this as a need. The reason behind this is that we teach in a high poverty area and children can present with very limited language and numeracy skills. The grade one teacher had identified that he would like students to come to grade one with some printing skills but because of the academic focus on reading and math, this was one area that we did not have a lot of time to focus on. We also felt it was valuable for students to work on their fine motor skills as well as to learn from the one-on-one type of instruction about how to properly form letters. We hoped this would improve the legibility of the students' printing and encourage more writing.

The second group of apps that we chose was a package of all the *Bugs and Buttons* apps that we could purchase as a bundle. The *Bugs and Buttons* app was one I had used with my daughter and some of my students. The graphics and design of this app are very attractive and children seemed to like this. They also seem to enjoy that all the learning opportunities were set up as games. As educators, we liked that there

were apps that focused on several different literacy and mathematics skills such as sorting, matching, and counting. In addition, we chose to start with *PicCollage*, which we had both already used in our classrooms for documenting student learning. Teacher 2 had also used it as a writing tool for her students.

The final app that we chose was *Adobe Spark* which is an app that can be used to create simple videos. I had used this app before as a whole class presentation and with an individual student to create a video. It allows the user to take or choose pictures from the camera roll and then compile then to create a story, which they can narrate. We liked that given some guidance, we felt that some students could create their own videos. Students could narrate each frame by recording their voice. At the end of the project, all the frames which could include photos/text and audio went together to create a video story. Both *PicCollage* and *Adobe Spark* were chosen because they allow students to interact with and alter the content, which was different than the apps above which were closed content.

We felt that this mix of apps would help us to get a better understanding of the different ways we could use iPads in our classrooms. We also decided that we would start with *Handwriting Without Tears* and *Bugs and Buttons* as a part of a guided group with the teacher. This would allow us to make observations of how the students interacted with these apps and how effective they were as teaching tools. It would also help us to examine how best to facilitate technology use with students. We took observational notes on paper as students were using the iPads of thoughts we had about the iPads and/or apps, questions and observations.

Session 2

Two weeks later, we met again. Originally I had intended that there would be greater time between these sessions but with delays in REB approval from the university, we had less time for the study. We discussed the questions for session two about how we had used the iPads in our classroom and our observations and realizations from this. Again, this session was recorded in the same way as the previous one and transcribed. I shared that I had added an app during the two-week period called *Magnet Letters* because I felt it would help with my learning goals for students and it only cost $1.39. In this session, we determined that we would add an additional app to the purchased apps that focused on innovation because that was one curriculum area that our apps did not cover. We decided to explore use of *Minecraft* on creative, peaceful setting as a guided group.

Session 3

We met one last time in mid-January to discuss what had happened in our classrooms over the past couple of weeks. Because students and teachers had two weeks of holidays, we did not have as much time to use the iPads. It was also busy during the last week of December with holiday events happening throughout the school so students may not have had as much time to interact with the technology. When we met in January for our last meeting, we had three weeks of in school time since the last meeting. During this meeting we recycled the questions from session 2 and also focused on what our overall learning had been from this project.

2.2 Coding of Research

I used an app called *Transcribe* to transcribe the data. It was easy to use and allowed me to transfer the recording from my iPhone recorder for transcription. As I

transcribed our conversations during the meetings, I highlighted themes and pieces of information that linked to the research in my literature review by adding a comment beside them so I could go back at the end and look at all the notes I had written. This helped to speed up the data analysis process to do it while transcribing. Lichtman (2012) describes this as the *coding* of the data where the researcher highlights data that relates to key concepts. Then I reviewed all the transcription data creating separate documents for each key concept identified. As I went through this process, I could see where certain ideas fit together and/or overlapped. As I noticed this, I revised titles for each concept. I transcribed after each meeting adding codes as needed. When data was grouped by key concepts, I reviewed the data in each section and pulled out key ideas and quotations as I began to write my findings for each area. These were also written in the first person and contain many of my own reflections on this process. I also spoke to my project supervisor and she helped me to identify stories from my research that would be valuable to share in my findings.

Lichtman (2012) also identifies narratives as a way of making sense of the data. I used both a coding approach and narratives to interpret the data because, though I had identified key themes in the research, I felt it was important to add the stories behind each theme that emerged. When I had completed writing my findings in each area, I then printed off all my writing and puzzled together how it all fit together in the context of my research problem.

Since my previous degree had been in science I was used to writing research that aimed for objectivity. This research was very different as I have been intimately involved in it from start to finish as the researcher, subject, interviewer, and interviewee.

Lichtman (2012) explains that qualitative research acknowledges that all data and findings are filtered through the perceptions of the researcher. In qualitative research, the researcher needs to examine his/her own biases and consider its effect on the research process and embrace his/her role in interpreting what is said during the interviews (Lichtman, 2012).

3 Literature Review

3.1 Overview

This review of the literature examines changes to Kindergarten curriculum policy in Ontario. It also discusses barriers to technology use for early childhood educators and research to date on digital play and learning with iPads. In addition, the theoretical framework used in this study is outlined.

3.1.1 Curriculum policy in Ontario.

In November 2009 the former Deputy Minister of Education, Charles Pascal, released a report for former premier Dalton McGuinty on the implementation of Ontario's Early Years Education Program (Pascal, 2009). In it, one of the recommendations was the implementation of the Full Day Kindergarten (FDK) program. His report argues that the best public policy to drive student success would be the implementation of a full day program for both four and five year olds in Ontario (Pascal, 2009). Ontario moved forth with this initiative in September, 2010 beginning this program in nearly 600 schools (Vanderlee, Youmans, Peters & Eastabrook, 2012) and putting billions of dollars into hiring teachers, early childhood educators and renovating and/or building classrooms (Babbage, 2009; Gilles, 2013). The main goals of the program are to create a strong foundation in the early years, to ease the transition to grade one, to allow young children to learn in a play-based learning environment, and to improve student success in the future (Vanderlee et al., 2012). The program was phased into all schools in Ontario gradually. Full implementation was achieved in September 2015 (Babbage, 2009).

The Full-Day Early Learning - Kindergarten Program Draft Version was released by the Ministry of Education in 2010 explaining the learning goals for the program (OME, 2010). It was supported by theories and research of constructivist theorists such as Piaget (1936) and Vygotsky (1978). This policy stated that one of the main goals of the program was for children to learn in a play-based environment because play forms the foundation of intellectual, social, physical, and emotional skills that children will need to lead successful lives (OME, 2010). The Elementary Teachers Federation of Ontario (ETFO) (2010) identifies five elements of play as:

1) Pleasurable and enjoyable,
2) Intrinsically motivated,
3) Spontaneous and voluntary,
4) An activity that actively engages the player, and
5) Involving an element of make-believe.

(ETFO 2010, p. 5)

The five fundamentals of play-based learning outlined in the Kindergarten curriculum (OME, 2016a) are:

1. Play is recognized as a children's right, and it is essential to a child's optimal development.
2. All children are viewed as competent, curious, capable of complex thinking, and rich in potential and experience.
3. A natural curiosity and a desire to explore, play, and inquire are the primary drivers of learning among young children.
4. The learning environment plays a key role in what and how a child learns.

5. In play-based learning programs, assessment supports the child's learning and autonomy as a learner.

   (OME 2016a, p. 12)

There was a further change to the curriculum when the final Kindergarten Program document was released in 2016. Rather than categorizing learning goals by subjects (such as Language and Mathematics) the learning goals were separated into four frames or domains (broad areas) of learning;

1. Belonging and Contributing,
2. Self-Regulation and Well-Being,
3. Demonstrating Literacy and Mathematics Behaviours, and
4. Problem Solving and Innovating.

   (OME, 2016a, p. 13)

These four frames are based on the *ways of being* pedagogy outlined in *How Does Learning Happen? Ontario's Pedagogy for the Early Years* created by the OME (2014). Belonging, Well-Being, Engagement and Expression are identified as four foundational conditions that all children need to learn and will naturally endeavor to find. When these conditions are fulfilled, children's learning and development are optimized (OME, 2014). Each of the four frames in the Ontario Kindergarten Curriculum (2016a) align with one of the four foundational conditions (See Figure 1). Curriculum outcomes are called "expectations" (OME, 2016a, p. 121) and these are categorized by the frame that they most relate to, although some expectations fit into more than one frame.

Figure 1. The Four Frames of Kindergarten as they connect to the four foundational conditions. (OME, 2016a, p. 14)

This organization of the kindergarten curriculum focuses on many different foundational aspects of student success and on children's learning skills through authentic experiences as opposed to in isolation (OME, 2016a). Reporting on student progress in Kindergarten also shifted in policy from a progress report with traditional subject areas and levels of achievement, to the less formal *Communication of Learning* documents with written feedback for caregivers about their child's development in each of the four broad areas of learning or frames (OME, 2016b). This represented a shift from outcomes-based reporting to anecdotal reporting.

Two areas: the focus on learning through play, and the new foundation based on the four foundational conditions for learning represent changes or pedagogical shifts for

educators. King (1993) describes this as a shift of the teacher role from “sage on the stage” where the educator is viewed as the transmitter of knowledge to the “guide on the side”. In this new role the educator is viewed as the facilitator of learning creating opportunities for students to construct their own knowledge (King,1993). Developing the whole child, and capitalizing on children’s natural curiosity and the authentic learning that occurs during play have now become important parts of the new curriculum policy. This focus is consistent with curricula in many other countries (Edwards, 2013). As the direction of the curriculum focuses on child development through play, in this study, we examine how children’s mobile technology use changes as a result.

3.2 Barriers to iPad Use

3.2.1 Concerns about technology use with young children

There are different perspectives about the role of technology with young children because some studies focus on the negative impact of too much screen time while other studies look at technology’s advantages. These studies report mixed findings and focus on computer and mobile device use. Some studies show that technology can benefit student learning while other studies reviewed show that teachers have some concerns with technology in general as student and caregiver time spent on screen may take away from learning opportunities.

Ernest, Causey, Newton, Sharkins, Summerlin & Albaiz (2014) find that one of the most prominent debates about technology and young children is with respect to screen time. Their review of the literature finds that many studies show the benefits of technology use to the learning of young children such as increased vocabulary, higher achievement, modelling of social skills, promotion of visual and kinesthetic response

skills, problem solving and assistive technology for special needs students. There are concerns, however, about how excessive screen time may affect young children. These include obesity, sleep disturbances and poor relationship skills. Another concern cited in the literature is exposure to violence and harmful commercialism (Ernest et al., 2014).

Flewitt, Messer and Kucirkova (2014) investigate how iPads could be used for early literacy learning and also the challenges with using this technology. Initially all educators in the study acknowledged the potential that iPads have as a learning tool but also were concerned about the negative effects of iPad use such as addiction or overstimulation. Other concerns were that technology use encouraged children to be inactive and that technology was inhibiting early language learning opportunities for children because caregivers seemed to spend so much time on their devices. Educators felt that this reduced the amount of time caregivers spent interacting with their children. Additionally, teachers felt that playing fast-paced, instantly gratifying, digital games would not prepare students for tasks that require patience and perseverance such as reading and writing. Though teachers had concerns about technology use, they also acknowledged that it was important for teachers to use technology in classroom to prepare students for a digital future. As teachers used iPads more, their concerned lessened (Flewitt et al., 2014).

In 2010, a joint position statement was released with guidelines for early childhood educators about technology use in early childhood education settings (Wartella, Blackwell, Lauricella & Robb (2013). Two American organizations called The National Association for the Education of Young Children (NAEYC) and the Fred Rogers Centre for Early Learning and Children's Media at Saint Vincent College co-authored the

statement. In 2012, was revised to account for the rise in public interest in digital media for young children, the expansion of the digital media market for educational products for young children, and an increased demand for professional development for early childhood educators. The main points of the position statement were:

1. When technology and digital media are used intentionally and appropriately with children's developmental abilities, age, and social and cultural life context in mind, they can be effective learning tools for young children. Ideally these tools should be used to enhance other classroom activities such as play. They can also be effective learning tools for students with special needs.
2. Access to media technologies for children in early childhood programs should be made equitable for children in all settings and from different backgrounds. Educational goals should include the development digital citizenship and critical thinking about media.
3. Recommendations from public health organizations about children's exposure time to media should be followed by teachers. Screen time for children should be limited to under two hours a day for school age children. Exposure to violent or sexualized content should be avoided to prevent emotional or physical harm to children.
4. Ongoing professional development should be provided to early childhood educators so that they have the tools to effective use technology in their classrooms in ways that are intentional and developmentally appropriate.

(Wartella et al., 2013).

This position statement provides guidance for early childhood educators, administrators and school boards as they implement technology into early childhood education settings. It promotes a balanced approach to technology use and highlights that technologies can be effective learning tools if context, content and time are carefully considered (Ernest et al., 2014).

In addition to concerns about the developmental appropriateness of iPads, there are other obstacles to successful iPad implementation in classrooms which have been reported. Blackwell, Lauricella, Wartella, Robb & Schomburg (2013) conducted a study surveying 1,457 early childhood educators that focuses on how technology is being used in schools with young children and support provided to educators to use technology with students. The study finds that although educators may have access to technology, it is under-used in the classroom. This is especially prevalent in early childhood education (Blackwell et al., 2013). This was consistent with findings by Blackwell, Lauricella and Wartella (2014).

3.2.2 First and Second Order Barriers

Not every teacher of early years children chooses to use technology. Ertmer (1999) describes barriers to technology integration as first and second order barriers. First order barriers deal with environmental conditions that would inhibit technology use. These could include inadequate wireless internet, lack of technology access for teachers and students, and unsupportive administration or school boards. Second order barriers refer to barriers that relate to an educator's own attitudes and beliefs, knowledge and skill level. Ertmer (1999) suggests that these barriers are the most

difficult to overcome because, even when the infrastructure is available in schools, if teachers do not think positively about the role of technology in learning, they will not support its use as an educational tool.

A subsequent study conducted by Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, E. and Sendurur, P. (2012) finds that educators with student-centred beliefs reflect those beliefs in their classroom practices. These include authenticity, student choice, and collaborative learning opportunities. They find that a teacher's belief that technology is important to student learning has the greatest impact on their success in implementing technology in their classrooms. Teachers who were successful at implementing technology into their practice felt that the greatest barriers for other teachers in using technology are: their attitudes, beliefs, and skills and knowledge (Ertmer et al., 2012).

Positive beliefs about technology's role in helping children to learn is a strong predictor of teacher use (Blackwell et al., 2013; Blackwell et al., 2014). Despite the evidence that second-order barriers play a large role in the success of technology integration, first-order barriers whether perceived or real still impact use (Blackwell et al., 2014).

Wartella et al. (2013) and Liu, Navarrete, Scordino, Kang, Ko & Lim (2016) find that younger educators are more likely to respond positively to using technology in the classroom. They also find that supportive administration, professional development and support for teachers play a role in how teachers feel about technology. Ertmer et al. (2012) report the same finding about teachers, noting that the support of administration and professional learning networks helped them to become leaders in integrating technology into their practices. Blackwell et al. (2013) find that teachers who have

professional development focused on using technology with their students are more likely to use iPads in the classroom, and as the frequency of professional development increases, so does teacher use. Blackwell et al. (2014) caution that as school boards spend increased amounts of money on technology, it is important to ensure that teachers are receiving an adequate amount of support and that there is a strong technology vision in place. Otherwise the money spent on technology may go to waste (Blackwell et al., 2014).

According to Liu et al. (2016), when teachers had training and access to iPads, their attitudes about the benefits of using them in the classroom increased. In a study on iPad integration into K-12 classrooms, teachers reported that there was a lack of time to integrate iPads into instruction. Teachers also struggled with connectivity and device management issues. Second order barriers were present such as a shift in teacher-student roles and the challenge of finding appropriate apps for students at different levels. Teachers felt they didn't have enough time to learn and explore how to use the iPad in their practice and it was a challenge to find the right app for the curriculum goals especially with students at so many different levels (Lui et al. 2016).

Flewitt et al., (2014) report similarly that when iPads were introduced into three early years classrooms, novice teachers shared that they spent hours of their own time searching for suitable apps for their students and also planning lessons around apps. Technical difficulties also hindered their ability to use iPads as a learning tool (Flewitt et al., 2014).

In addition to these first and second order barriers, common to all teachers, early years educators face another dimension to successful technology use, which is how to incorporate technology into a play-based program for young children.

3.3 Digital Play

One reason that technology is so underused in the early years may be because teachers are unsure of how technology fits into a play-based learning environment. According to Vanderlee et al. (2012) in an OME report on the implementation of the Ontario full-day early learning kindergarten program, kindergarten classrooms in Ontario should be providing children with large blocks of uninterrupted play totaling a minimum of one hour in both morning and afternoon. This time should be child-directed, providing a stimulating environment for young children and teachers should engage with students in sustained, shared thinking (SST) (Siraj-Blatchford, 2007). SST means that educators purposefully and sensitively intervene during play to help children to gain new understandings and move forward in their learning. This includes an assumption of developmentally-appropriate practice with educators assessing where the child is currently at in his/her development and how they can provide further learning opportunities to move the child to the next level (Roberts-Holmes, 2014). It also provides an opportunity to help students to develop metacognitive skills when educators notice and name the learning during interactions (OME, 2016a).

Edwards (2013) sheds light on a problem that exists for educators in early childhood settings, noting that separation of play from technology use is evident in several international curriculum documents (Edwards, 2013). There is very little information about technology in the OME Kindergarten Curriculum (2016a) and there is

no direction for teachers about how to incorporate technology into a play-based pedagogy (Edwards, 2013). This appears to be a policy gap and provides little direction for teachers in this area.

3.3.1 Digital Literacy

Goodman (1986) describes children's early literacy learning as the roots of literacy. This includes understanding that print means something; use of print, and other cueing methods to make sense of environmental print; seeing themselves as writers; and communicating about written language through oral language including how written language works. Although at the time Goodman (1986) was referring to traditional print-based literacy, Beschorner and Hutchinson (2013) apply this theory to today's young children whose environment includes digital print and digital applications for reading and writing. As children develop literacy skills through their participation in a culture immersed in technology, Edwards (2013) suggests that new perspectives on the relationship between play and technology need to be found that help teachers understand that digital play helps children to understand the world around them. Edwards (2013) suggests that play is culturally adaptive and as we become more and more immersed in technology, it becomes part of our children's play (Edwards, 2013). If educators speak to children about their play using digital technologies using SST practices (Siraj-Blatchford, 2007), Edwards (2013) feels that teacher pedagogical practices would shift to ones that involve technology in play. This would also help students to think critically about how they play and to develop new understanding of digital literacies (Edwards, 2013).

According to Rowsell and Harwood (2015) children's play changes as they interact with iPads. In their study, children were witnessed consuming media texts and then transforming and personalizing them based on their own interests and backgrounds. Children moved between using iPads independently or with peers, producing a new digital text based on an app or media text and more traditional play such as blocks or sand table play. Often the digital text inspired another form of play such as drawing a picture of favourite characters or role playing based on characters in the text and children remixed the text to add in their own experiences. Researchers feel that this type of remixing of texts during play may happen without the technology, but that the introduction of the iPad creates digital media texts and opportunities to produce new texts more accessible for young children. IPads in the early years environment diversify the ways in which the children made meaning. For example, while playing the Lego app, one boy left the group and returned with a structure he had made of Lego. As the students was telling the educator about his structure, another student pointed out that it was real Lego. These opportunities to engage in the material and immaterial worlds and discuss their findings were more prevalent when iPads were part of the learning environment (Rowsell & Harwood, 2015).

3.3.2 Educator Involvement in Play

Plowman and Stephen (2005) observed that when technology was incorporated into the play environment, early childhood educators had a hands-off approach to play using technology. This resulted in several issues:

- the emphasis was on child-directed play so teachers rarely offered support to children using technology;

- Teachers did not provide much guidance as to how to use technology;
- If teachers did provide feedback it was reactive and related to things such as turn taking while using the technology; and
- Many children had never had exposure to computers so if they did not have help, the learning/experience was often limited (Plowman and Stephen, 2005)

Based on observations from this study, Plowman and Stephen (2005) identify three categories of educator involvement in computer play: reactive supervision, guided interaction, and a combination of both (hybrid). Reaction supervision consists of dealing with problems that may arise when students used the computer during play such as turn-taking or making sure students did not damage the computer. In the case of guided interaction, the educator's role is to help students to learn about technology and how to use it. These interactions occur in one-to-one or small group interactions. Educators also need to be knowledgeable about the technology to provide this type of support. Plowman and Stephen (2005) find that this type of interaction is rare in early childhood education settings. A hybrid approach to technology would be to provide some direction on how to use the technology and then once children know the basics provide only guided instruction for those that need it and reactive for the other children. Most settings did not have formal procedures set up for the introduction of new technologies and researchers observed a lack of guidance from adults when children used technology (Plowman and Stephen, 2005; Flewitt et al., 2014). This resulted in friction amongst students over who would use the iPads, improper use of iPads resulting in apps not functioning properly or children's work being lost (Flewitt et al.,

2014). Educators believed that children would benefit from a hybrid approach but had not considered how they would implement it in a play-based setting (Plowman and Stephen, 2005). As the main pathway of learning for children is through play-based learning, greater research needs to be done as to how technology fits into this pedagogy and how teachers can effectively use technology in a play-based learning environment (Bird & Edwards, 2015; McManis & Gunnewig, 2012). Research which was available for the review of literature in this area was minimal. A search through Google Scholar using the search terms “play based learning” and “early years” and iPads” resulted in few articles that actually dealt with this specific topic. This appears to be an additional gap in the literature.

3.4 Learning With iPads

3.4.1 Learning Skills

Studies show increased student motivation when using iPads (Flewitt et al., 2014; Kucirkova, Messer, Sheehy, & Flewitt, 2013; Wells, Sulak, Saxon & Howell, 2016). This may be due to the ease of use for young learners due to the touch screen interface (Neumann, 2014).

Flewitt et al. (2014) conducted a study of iPad implementation in three early years classrooms, observing that students enjoyed that they were able to undo and review stages of what they had done and that this seemed to increase their confidence because the consequences of making mistakes are minimized. Children responded positively to the responsivity of the iPad and how quickly they could produce results. Teachers also reported students demonstrating higher levels of understanding using iPads than conventional pencil/paper tasks and reading assessments. Students also seemed to be motivated by their ability to independently use iPads as opposed to

traditional computers due to the touch screen and picture icons. Educators commented on the children's ability to focus for longer periods of time on iPads and thought that it might be attributed to the interactivity of the apps used (Flewitt et al., 2014). Similarly, Lui et al. (2016) found that some teachers commented that IPads enabled them to program for students at many different instructional levels which may have also increased student motivation.

Flewitt et al. (2014) found that, when iPads were introduced in early years settings, educators noted that some children were very good at using iPads because they are used to using touch-screen devices at home. They also observe that the 'novice' children seemed to learn quickly how to use the devices. Educators described some children as more skilled than staff at using the technology and commented that the students taught them how to use it (Flewitt et al., 2014). This suggests that using these technologies in class may create opportunities to empower students as leaders and shift the teacher-student dynamic from teacher-centred to more student-centred.

Beschorner and Hutchison (2013) report that when using iPads, children often discussed what they were doing with peers and co-created and/or helped their peers navigate the app. One of the reasons for this might have been because they could view their peers' screens and sharing what they were doing with their peers was an acceptable practice. Frequently, students would be observed helping each other navigate the technology.

Educators felt that iPads allowed more seamless communication with parents through apps that automatically shared information with them (Lui et al., 2016).

Teachers were also able to easily email student work to parents creating increased motivation for students to learn and share their work (Beschorner & Hutchison, 2013).

3.4.2 Language and Mathematics

Studies using iPads in Kindergarten report positive results for early literacy skills such as alphabet knowledge, print concepts, and emergent printing (Beschorner & Hutchison, 2013; Neumann & Neumann, D., 2013; Neumann, 2014). Wells et al. (2016) find that iPad apps focused on printing seemed to increase letter output but traditional methods seem to produce better letter formation and orientation. Beschorner and Hutchison (2013) found that young children who had access to iPads in a preschool setting chose to use a number of writing apps including Doodle Buddy and Drawing Pad where they created messages using drawings and writing at various stages of development. The multimedia features of many apps allowed students to add photos, videos and audio to their writing to create multimedia presentations (Lui et al. 2016).

IPads were also used for reading. According to Beschorner and Hutchinson (2013), in addition to the features of an e-book, some applications have additional features such as iTouch Books which allow the reader to record their own voice reading the book. Other apps highlight the words as the story is being read to students and allowed them to stop, review, or go ahead in the story. This allowed children to move along at their own pace. They also found that teachers could use iPads to help students to develop digital literacy skills. Students had to touch specific icons which led them to a specific application. As time went on students began to recognize the symbol and the text, and understand that they held meaning. Students in this study also

discussed what icons meant and helped each other to find specific apps (Beschorner & Hutchison, 2013).

Apps used for mathematics focused on single or multiple mathematics skills such as number recognition, counting, and identifying shapes (Neumann, 2014). Schacter et al. (2016)'s study indicated that when apps were created/used with specific learning goals in mind, they helped to close the achievement gap in lower income schools.

3.4.3 Apps for Young Children

An Australian study of iPads and early learning in the home indicated that Australian children under the age of six have an average of five different apps accessible to them at home and these apps fit into six categories; gaming, creating, e-book, literacy, mathematics, and other educational apps (Neumann, 2014). The results of the study by Neumann (2014) also indicate that the apps young children used most at home were in the gaming category such as Angry Birds and Fruit Ninja. Although research suggests that gaming apps are the most appealing to young children, most studies about the effectiveness of iPads as a learning tool for young children have focused on the literacy and mathematics categories (Neumann, 2014).

Many studies indicate that the quality of the apps used and the instructional strategies used by the teacher play a large role in the effectiveness of iPads as a learning tool (Bird & Edwards, 2014; Edwards, 2013; Lyons & Tredwell, 2015; McManis and Gunnewig, 2012; Schacter et al., 2016; Zaranis et al., 2013).

An app's design can be 'closed' or 'open'. According to Flewitt et al., 2014, closed-content apps have content that could not be altered or extended . These apps generally operate based on behaviourist theories whereas players get rewards for

progress (usually in the form of tokens). These are interactive but repetitive in nature, and these types of apps help students to learn vocabulary and/or phonics. These closed apps lack the capacity to foster creativity because students are unable to produce their own artifacts. Some children also seem to tire of the repetitive tasks. These closed content apps were most useful when they were used as an avenue for students to master certain skills such as letter recognition and spelling. Many apps available for young children had repetitive game formats and were 'closed' content (Flewitt et al., 2014).

'Open content' apps, by contrast, allow students to alter and extend the content (Flewitt et al., 2014). This allows users to personalize activities. An example is use of the *Our Story* app which allows children to take photographs and then select the ones to be in the final product. Students then are able to add voice and/or text to create their own personalized stories, which they can then look at over and over again (Kucirkova et al., 2013).

3.5 Theoretical Framework

Best practices for integrating IPads into the classroom and models of technology use have been theorized (Lyons & Tredwell, 2015; McManis & Gunnewig, 2012; Northrop and Kileen, 2013). Best practices for integrating iPads into early learning classrooms include the gradual release of responsibility, establishing rules for using technology (Lyons & Tredwell, 2015) and focus on curriculum goals (McManis & Gunnewig, 2012). Northrop and Kileen (2013) suggest that applying the gradual release of responsibility framework (Duke & Pearson, 2008; Pearson & Gallagher, 1983) to literacy learning on the iPad use will help teachers to program for students at

the accurate levels. Before using iPads, McManis and Gunnewig (2012) suggest first determining the learning goals, and how technology can be used to meet these goals and how it will be integrated into the curriculum. McManis and Parks (2011) also created *The Early Childhood Educational Technology Evaluation Toolkit* which is a checklist based on a literature review of educator considerations when evaluating technology learning tools for young learners. Puentedura (2013)'s Substitution Augmentation Modification Redefinition (SAMR) Model and the Power (2013) Collaborative Situated Active mLearning (CSAM) Framework give educators instructional models to use when choosing learning activities with technology.

Though these models provide direction for educators when choosing learning experiences on iPads, none specifically address the needs of kindergarten teachers as they navigate technology in a play-based learning environment. As MacCallum and Bell (2016) have highlighted, there is a need for research that will help the early childhood educator community with best practices for technology implementation for this specific population. As found in many international curriculum documents for the early years, the absence of guidance about the relationship between technology and play is a dilemma that is not unique to Ontario teachers (Edwards, 2013).

The action research study described here follows the journey of two educators as they aim to develop greater understanding about how to use iPads in the classroom to meet multiple learning goals across the four frames of the Ontario Kindergarten curriculum. Since professional learning opportunities and time to learn about iPads have been identified as important factors to change teachers' skill levels and attitudes about technology (Wartella et al., 2013; Liu et al., 2016), the teachers were given time

to work collaboratively following the teaching as inquiry model. The teaching as inquiry model provides teachers who want to wanting to improve their own practices with a framework for action research. In this study, this framework will be use to describe the process of learning that the teachers go through and their findings related to the research question:

1. How can Kindergarten educators use iPads to meet multiple early learning Kindergarten goals across the four frames?

According to Timperley (2010), teachers assess student knowledge using formal and informal assessments in order to determine students' needs. As teachers reflect upon student needs, they are also reflective about what professional learning is needed to improve learning for students. As teachers learn new skills, they again return to the assessment of student learning. This cyclical approach mirrors the learning of the students (Timperley, 2010). The goal of the research described here is to provide insight into the complexities of using technology with young learners in a play-based setting and to provide the early childhood education community with best practices for iPads in their classroom.

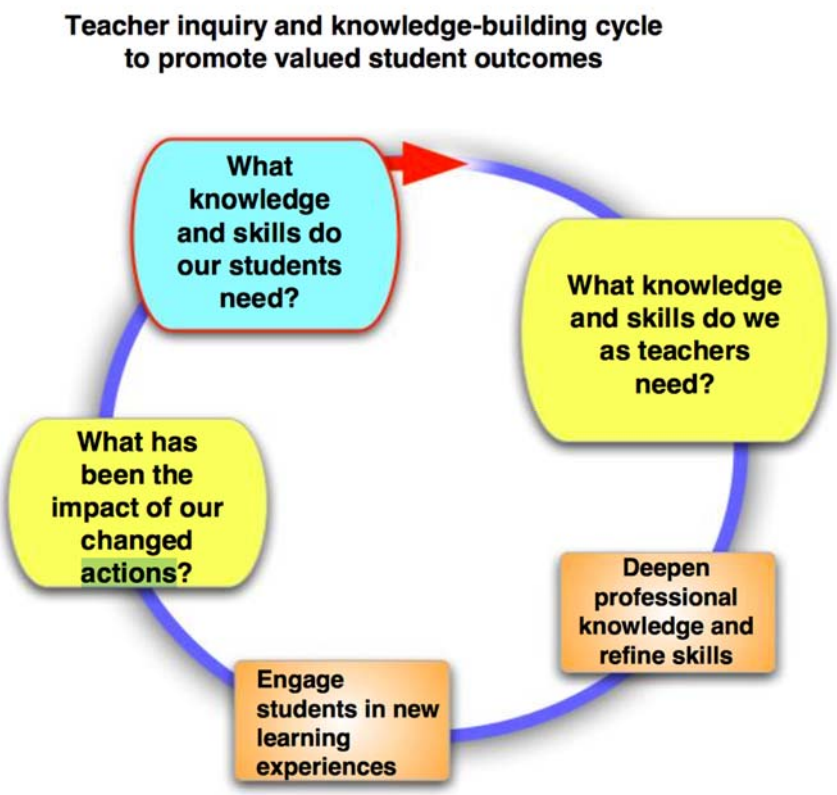

Figure 2. Teaching as inquiry cycle

Source: Timperley, 2010, p. 4

In Blackwell's (2013) research, she drew upon Orlikowski's (1992) Duality of Technology model to explain how teacher attitudes and practices were affected by the implementation of iPads into early childhood education settings. Orlikowski (1992) suggests *the duality of technology* as a way to frame the relationship between an organization, agents and technology. The agents, in this case are the educators who apply the rules, social norms and resources of the organization and of the larger society. Their actions have the ability to change the structures within an organization. Along with the causal relationship between the organization and the agents, the addition of technology used in innovative ways by the agents can also change larger institutional

structures (Orlikowski, 1992). Blackwell's (2013) application of this theory to education, where teachers are the agents, schools are the organization and iPads are the technology is one theoretical framework which is used in this study to examine how pedagogical changes happen and affect the greater educational community. For the purposes of this study, the institution will be the school and also the other Kindergarten teachers within the school board. Since Kindergarten is such a specialized learning environment, the results of changes in teacher attitudes and practices will likely be most applicable for other Kindergarten classes.

4 Findings

4.1 Meeting Curriculum Goals Using iPads

4.1.1 The Four Frames and iPad Use

Before the present study began, students were freely using apps on the iPods and iPads in unstructured ways. When we began the study, we decided to limit student choice in order to control what apps students were using. Our goal was to ensure that the apps focused on kindergarten curriculum goals. Interestingly, the curriculum goals we chose to focus on were within one frame of the curriculum, *demonstrating literacy and mathematics behaviours*. This was not intentional on our part, but as the study progressed, and as I became more and more familiar with the new curriculum, which had only been released the previous year, I realized how limited our definition of *learning* was for our students. We began to look at the other curriculum areas, and how and if, we were addressing goals in these areas and realized that we were also meeting many other curriculum goals through the use of iPads and the apps we had selected. For example, we noticed that a lot of dialogue happened between students

when they were using iPads. They were frequently looking at each other's screens and asking, "Hey, how did you get that? Can you help me?" The iPads were creating opportunities for students to develop skills in the *Belonging and Contributing* domain as they interacted with their peers.

Problem solving and innovating. We found that the app *Bugs and Buttons* provided some different opportunities for children to solve problems. For example, instead of showing students patterns and asking what shape comes next, they were asked to fill in a blank or students were given a sequence of letters with one missing and had to identify what it was. We realized that some of our children, who could correctly answer patterning questions that teachers had given them, were now struggling with some of these tasks using apps. This gave us a unique opportunity to understand student thinking and how we can help them to learn new skills while using technology. We noticed that many of the learning tasks on the iPads were set up in novel ways so students had to access new thinking about how to solve the problems in each activity. We commented on this, saying:

> "I think with the problem solving, the thing I like about Bugs and Buttons is it gives a different approach to patterning, and a different approach to even like the sequence of letters in the alphabet. It shows them in a different way so they have to kind of think about it because it's not just like A, B, you know what I mean?"

Self-regulation and iPads. When we started this project we had some negative preconceptions about how iPads and other technology were used by students. We began the project discussing how technology was often used in schools to placate

students with behaviours as sometimes students are allowed to choose games to play on the computers during recesses or when their behaviour was disruptive. We also felt that many of the apps used by those students were not useful learning activities. Words like “mind-numbing” and “fluff” described certain apps that didn’t seem to have an academic purpose. For this project, we decided to choose apps that we felt were teaching curriculum goals, and we would introduce the new iPads in guided groups. In these groups students were told which apps to explore.

During this time, we observed that most students were engaged. I found that the *Handwriting Without Tears* app was too difficult for some of my students who did not have the focus to listen to the directions given by the app. Although most of the students followed my directions, two of my students with particular behavioural challenges did not; and it was therefore a challenge to try to get them to participate within the group.

When we returned for our second discussion we spent considerable time talking about our frustration that some of our kids who we felt were behind in literacy and numeracy skills showed preference towards games that did not seem to have academic purpose. An example was a game within the set of *Bugs and Buttons* activities where the student drives a race car.

As the time progressed in this project, we started to become more open to students working or playing on the iPads without teachers directly guiding them through a specific app. At our final session, our views seemed to have changed about our students’ ability to regulate their behaviours. This did not necessarily mean that they were following our set rules but they were demonstrating self-regulation skills in a way

that we had not previously considered. I also realized that my rules may have in fact been hindering students' ability to self-regulate. Here are some comments,

> "One of the things I realized is that I need to kind of get out of the way. I was really gatekeeping what the kids could do, how long they were going to do it for and part of it, because… I want to be able to get a handle on some of these apps as opposed to all these different things happening at one time and I don't even know what app they are on. But the thing that I realize is that, over the last little while I have been a little more lax about it. As long as you print for five minutes just go on whatever, you know? And I've noticed that even though some of them are on the racing one... If I look at that as instead of they are doing a garbage app, that's their self-regulation time. They've done something that was a little higher stress, now they are taking themselves off and they are doing something that is lower stress; different part of the brain. Because normally they wouldn't stay on it forever. They didn't stay on those apps forever. They would do that and then they would go back to something else."

I also realized that initially my apprehension towards the more engaging gaming type of apps such as *Minecraft* was that students would become so immersed that they would never get off that program. As I watched the students, however, I noticed that as excited as they were about *Minecraft* or the racing games, they used them for a while and then they changed to another activity. Just as if they were at the block centre and really engaged in a construction project. Eventually they are done and move onto something else. We also realized that, for some students, iPads helped them to

regulate their behaviour because it provided “alone time” within a very busy classroom. It also helped when students needed to calm down from a situation causing them frustration. Teacher 2 explained that sometimes when children were upset about something she would give them the job of deleting pictures or playing a game on the iPad and that it helped students to let go of their emotions about a situation.

> “Starfall is one that I have that I put them on, same idea. Ones who need to work on letter recognition and sometimes those who just need a break from an extended carpet time… It’s something that we can easily say - okay come over here and take a few minutes, sit down and put it on, you know Starfall or whatever and just work on this for a few minutes. And then they get distracted from whatever the situation was before and then come back and they rejoin. Sometimes it’s as a behaviour tool as well.”

In our discussion we also noted that though iPads are engaging and do help to mitigate some negative behaviours in students, the students who need one-on-one support in general still needed one-on-one support when using the iPad. Participating in this research had incredible value for us as teachers because in observing our students we realized that they were displaying self-regulation skills as they interacted with the devices and moved throughout the activities in the room.

***Noticing and naming the learning*.** Teacher 2 shared that she had begun to ask students to explain the learning task on the apps that they were using and to identify what they were learning while using *Bugs and Buttons* activities. She identified this as a key learning for her students to be able to communicate about what they are learning. I was very enthusiastic about also trying this with my class.

> “That’s kind of great that you are almost doing that from the back end. I haven't been doing that but I feel like I should be because it has them explain what they are doing which is a huge part of the program. Noticing and naming the learning, explaining what they are doing, what do they think the purpose is. As opposed to me being like, you are playing this game. You are doing this because you are practising printing and there you go, we don’t need to discuss this.”

This also tied in well with all curriculum areas because communication is a common expectation in all the domains.

4.1.2 Learning Through Play

When we started this project we were skeptical about how much students were learning during play with iPads. This was evident in statements that were made at the beginning of the program. Here are some of our comments,

> “I would rather have less apps than have ones that I know what the kids are doing and that have been rolled out well. And I know that they are, the kids are actually having some quality learning, even if the rest of the iPods are more of an exploratory thing, I would like that.”
>
> “They tend to be mind-numbing activities. Just to go and zone out. Like video games right?”
>
> “ I want them to use it for an actual purpose as opposed to go and play a game on it.”

Though the curriculum identifies *play* as the way young children learn best (OME, 2016a), our statements about play indicated that we felt that the most valuable learning

for students was when they were at a teacher-led guided group and/or when we dictated the apps that they should use. Our classroom practices with iPads in the initial stages reflected this.

In the final meeting, our views on play seemed to have changed. For myself, I had always felt that I was a supporter of play-based learning, but through this project I realized that my actions sometimes indicated otherwise. Initially I was rigidly focused on technology learning through teacher-guided groups instead of approaching iPad use with a focus on play-based learning. When Teacher 2 and I discussed how she had asked students to notice and name their learning she noticed that, when she did this, for some students it seemed to dampen their excitement about learning. This began a discussion about play and how we can support children's play as opposed to hinder it.

> "I think sometimes we have to be cognizant of not disrupting their play. Because sometimes, if I'm doing something and I'm really into it, I don't want to talk to someone about it either. I think we also need to step back and 'Do I really need to be… Am I just doing it because I think it is kind of that "thing to do" as a teacher…" We discussed that sometimes students are engaged in an activity because it's fun and that is part of their learning process. As educators, by observing our students and being responsive to their play we can "move them forward and by doing that, we can document right exactly where they are and then where to go from there."

These excerpts from our last discussion show the progression in our thinking about play and how we can support our students to learn through play.

4.1.3 Digital Literacy

As we become more and more immersed in a digital culture, I find as a teacher I struggle to keep up. This project helped me to realize just how quickly technology develops and how little training we have as teachers to prepare our students for their futures which will likely be immersed in technology. Through this project I realized that as a teacher I need to be teaching digital literacy. I also realized that my teaching partner and I were very confused as to what to do about many traditional classroom practices such as printing.

***Printing skills*.** We talked extensively during the first meeting about printing and how printing instruction in schools has changed with the increased prevalence of technology. We expressed our uncertainty about the importance of teaching children traditional printing skills. I felt that my main focus with my students was on learning letters and reading and early numeracy skills and that teaching traditional printing skills was something that just didn't seem to fit into the program.

> "That's kind of the fence… and… I kind of veer on the other end where… these kids are going to be writing using text to speech, they are going to be writing using text predictors, like it's going to be a whole different… you know?"
>
> "We don't leave notes, just text it… Do we really need to spend that much time on getting them to learn how to write an A properly? Does it really matter if they start at the top of the page or the bottom of the page? They are still making an A."

Despite that we were very torn about the place of printing in kindergarten, we decided to use *Handwriting Without Tears* as one of our pilot apps. We thought it would help students to develop fine motor skills and may give them more confidence in

forming letters and recognizing letters. Our conversations about where printing instruction fits or doesn't fit into a kindergarten program continued in our next session but as teachers we continued to feel unclear about our direction in this area.

Digital media. As we progressed through this action research, we began to take more notice to how children are learning early literacy skills through digital media. We said,

> "We think of literacy, it's not just reading and writing, pencil paper, it's even though you are on the iPad and it's technology there's still a lot of literacy behind the activities that they play. The games that have instructions, sometimes you have to read or have to at least follow along for what's happening enough to figure out what to do next and all of that kind of stuff so it's all in there."

At first I thought that literacy learning on the iPad meant that students would be working on letter matching apps or reading sight words. As the study progressed I realized that inherent in using the devices, students are learning about print. For example, one of my students was not yet able to follow the instructions and focus to do the *Handwriting Without Tears* app or most of the *Bugs and Buttons* apps. At first I was frustrated by his inability or lack of desire to do the app that I wanted him to do. He continually went on whatever he wanted to and it was a source of frustration for me. The only app that I was allowing kids to go on that he seemed to be able to sustain attention in was *Minecraft*. He enjoyed walking through the world and was excited when he saw animals like horses.

One day while he was on *Minecraft* he ended up on a page that asked him to type in his username and password. I assume that it was for buying more features on Minecraft. He randomly typed in letters and then told me that he was "doing his username." I watched him as he pretended to type in his username, explaining what he was doing as he typed in random letters. This was an "ah ha" moment for me as a teacher because I realized he was learning early literacy skills. He was understanding that the text meant something and though he cannot yet write words, he was practising using letters to communicate meaning. This was something I recognize all the time when students are using traditional texts but I realized I was unaware of the potential for developing literacy skills using technology.

Scaffolding Instruction. During meetings we also shared that we use different activities with different students depending on their developmental levels. For example, I used *PicCollage* with a group of students who had beginning reading skills and were able to sound out words with some assistance as a way that they could experiment and learn about digital media while practising writing skills. Students were asked to take a picture of something happening in the classroom during play and then write about it. While they were writing, we discussed the text predictor and how to use it, making sure their pictures and text were about the same theme and how to use the different features to make their *PicCollage* attractive such as changing the background and font. As I observed the children I also noted areas where I could guide them and I realized that as a teacher I was missing a whole area of my literacy instruction by not teaching more digital literacy skills. I also realized that technology like iPads gives kids the opportunity to go beyond drawing posters which is a way students are commonly asked to show

their learning about something. Due to the affordances of technology, they can now create high quality products such as videos, picture collages and posters that include images, backgrounds and stylized text. This made me realize that I have a lot more to teach students about how to show their learning and/or communicate meaning through digital media.

4.2 Teacher Time

Both of us had used iPads and iPods in our classroom in the past because there were some in the school before either of us had started teaching there. They already had apps on them that were chosen by previous staff. I had added a couple of apps and Teacher 2 had deleted and added some apps as well. She had deleted ones that she felt did not have any educational value. She discussed some of her thoughts about using these devices:

> "I've gone on and deleted a bunch of apps and then gotten new ones, but again they are not, they are not necessarily because of the age of the iSO or iOs or whatever it's called on there they're not as all having the same apps so I can't do a group session because they don't all have the same stuff. Some pods won't be compatible and they won't download and because they are so old."

In addition, I struggled with issues with connectivity because, although we have wireless internet throughout the school, my classroom had very low signal strength and often devices and laptop computers could not access wireless internet. It took me a considerable amount of time to access technical support. The technicians had to come to the school multiple times before the problem was resolved.

Along with issues with the functionality of the devices, we also found that having the time to explore apps, add them to the devices and to interact with students while using the devices was minimal due to the many other demands of a kindergarten setting. We both felt that we didn't have as much time as we would like to really understand what was happening with student learning using these devices. I had the experience of a student using *Bridgebuilder* and repeatedly doing it incorrectly. As I shared this with Teacher 2 we wondered if students are gaining any knowledge when this is occurring and how often this occurred in children's interaction with iPads. Since many of our students are not yet able to read, we assumed that following directions would be more difficult.

We also discussed that it takes time to maintain these devices and had both experienced disruptions to the classroom environment from iPad use such as when a student sets an alarm which goes off in the middle of a lesson, or when photos were taken by students causing the teacher to have to delete hundreds of photos one by one. One of us said that, "I think being quick is of the essence in kindergarten when this is a gazillion things going on at one time."

4.2.1 Ways That iPads Save Teacher Time

Though it took a lot of time to get the program set up in our rooms, as we progressed through the study we found that iPads made our jobs easier in many ways and saved some time as well. For example, we could assess students on tasks without the intensive preparation work on gathering manipulatives and worksheets. I had previously modelled my writing program after the *Handwriting Without Tears* program and created chalkboards for it, as well as gathered chalk, water, sponges and erasers

for each kid in the group. The instruction for a guided group of kids was intensive because I was constantly telling them what to do next multiplied by the number of kids in my group. When we used the app for this, I didn't need to prepare or clean up any materials and the app actually instructed the children on what they needed to do. This allowed me to just sit with students and watch them and make observations on what they were doing.

I also found that I could work on literacy skills such as making words and learning about word families using an app called *Magnet Letters*, which was far easier than using the *Making Words* program I had used previously. When using the *Making Words* program, the teacher needs to photocopy the worksheets for each child and then cut out all the letters for each child. Then the teacher leads students through a set of instructions and children organize their paper letters into words. In Kindergarten sometimes the kids would lose their letters or mix them up with the child working beside them which would cause a lot of frustration on my part and for the student. *Magnet Letters* allows the child or teacher to pick out the letters on the iPad that are the focus of the lesson. Then the teacher can go through the instructions with students without needing to do all the preparatory work that they would have to do the traditional way. This made it a far more attractive option for me.

We also discussed that as teachers of young children there is so much preparation work that needs to be done to create learning activities for students.

> "Quite honestly as a teacher, being in kindergarten, being in a grade one room, the amount of work that it takes teachers to make up activities that are like match the little M and the big M on popsicle sticks on this thing on

> that… It is so so much work and on the iPad you can do the exact same thing and some kid doesn't eat three of the popsicle sticks and then you are missing letters and your game is done or it gets lost or whatever. It's just all there and you can just do it and it's handy for assessment."

This saved a huge amount of time for us to use the tasks on the iPads that were already prepared. We also found that, for assessment, some children seemed to perform better on an iPad using a game format.

***Communication with parents*.** Another area where I found that the iPad made my job easier was in communication with parents. In the area where I teach in it is difficult to get parents involved in communication. I had started to use the *Remind* app to communicate with parents. Sometimes I would send out a reminder to all parents or let them know that I had made an update to our class website. Other times, while students were engaged in play, I would take a picture of a student and send it to their parents so there was that home-school connection and parents got a glimpse of the students' world inside school. Printing off pictures is quite time consuming and expensive and even email takes longer but once parents were signed up on this app I could very quickly send them a picture or note.

> "It's so quick and it's I feel like I am communicating far more with the parents and I feel like communication is far more positive because I'm not just communicating when something bad goes down. Right because it takes a lot of time… to write a note or to call home and say, well your child was on an iPad today, look how cool! It's hard to, even to email. It(Remind)'s so quick. Sometimes a kid is like, "Hey can you take a

> picture of this!" and I take a picture and I send it home. You know and then they can talk to their parent about it later and the parent has a discussion for the day. Or… I just read with your child, they are doing really well with this, this is what we are working on. And then they have what I am working on as well."

***Environmental impact and cost*.** In addition to less preparing for the teacher, the iPad allowed students to practise skills such as printing or work building without using repetitive worksheets. This reduces the amount of paper that is used for these tasks. I also no longer send home a paper newsletter as my communication to parents is through *Remind* and my website. This reduces our environmental impact and expenditures on paper.

4.3 Pedagogical Changes to Instruction

4.3.1 Documentation Student Learning on iPads

When the new curriculum was released, and our board started using *Office 365*, I was introduced to *OneNote*. I had used *OneNote* before but finally our board now had its own cloud where we could store data. Previously we were not allowed to store student information in cloud-based storage due to security issues. This opened up many possibilities for me because I have been constantly looking for more effective ways to capture student learning, especially in a play-based kindergarten setting. I immediately set up a class portfolio on OneNote. My ECE and I started using the iPad to document student learning. It was a comfort to know that should anything happen to the iPad, our student information was synched? synced within the cloud and could be accessed online from any device.

We spent a lot of time during the first session figuring out how to share the iPads between the two classrooms in a way that worked. It was very important for the teachers and ECEs to have dedicated iPads to use for documentation. . The reasoning for this was that we felt that these iPads needed to be available for educators to document learning in the moment. They also contained sensitive data that was not appropriate for students to have access to. Teacher 2 had not used *OneNote* for documentation but since my principal also had been suggesting that teachers use iPads and since we were beginning this project, she also set up a class portfolio. Since she had pre-existing paper-pencil systems in place for documenting, she felt that she would start small only documenting in the Literacy and Mathematics Behaviours section to start. From there she would see if it was a system that she could use to fit into or to replace her current one.

Because we were so focused on the apps we used, we didn't talk a lot about documenting the learning using iPads. Honestly, I wasn't sure if it fit into this project. In our third session I was shocked to hear from Teacher 2 that, "The biggest impact on my classroom is the ability to capture the student learning in the moment."
This was surprising to me because at the beginning of the project she seemed to be satisfied with her own systems of assessment. This gave us an opportunity to discuss our experiences using student portfolios in OneNote to capture student learning using the iPad. One of the things we discussed was that storage of student information on OneNote helps solve a problem of needing to store student work samples. Traditionally, we would keep student work in individual student portfolios that may have been housed in a file cabinet. Sometimes we would send artifacts of student learning

home, but would have to photocopy them if we wanted to keep them for our reference. On top of this, our classrooms have very little storage space. Using the iPads, we could quickly take a picture of the artifact of learning and it was stored within the digital portfolio on OneNote. Teacher 2 also found that iPads allow her to capture learning that she couldn't otherwise. An example was when she was assessing mathematical learning using manipulatives. She could easily take a picture to show how a student represented a number using various combinations of manipulatives.

One of the reasons that I was unsure about including *OneNote* is that our project is about how we can use iPads to meet multiple learning goals across domains in the kindergarten curriculum. When we are documenting the learning we are using it more for ourselves as educators than for student learning. I realized from our discussion that learning and assessment are intertwined because to meet those learning goals, we need to know where our students are at and how to best program for them to help them to move forward in their learning. Teacher 2 explains,

> "I use it for me, but it guides my instruction based on what I see and how I can collect things and what might have taken me a long time to jot notes or do whatever, it's easier done with the technology and using OneNote as well."

This helped us to have a better understanding of our students and I feel that this method of capturing student data changed the way that I teach. This quote explains,

> "It's evolved in our room and it does really change the way that we instruct because we are being more responsive as opposed to front end, this is the curriculum. It's more like, taking my iPad and going to where the kids

are at as opposed them all having to come to me to “learn”. And going to where they’re at and then seeing what learning is actually happening and how I can further support them. It’s a very different dynamic right?”

***Reporting on student progress*.** When we had our final session we were in the midst of writing the new report cards for the first time which were written comments about the child’s progress in each learning domain. I used the data that I had collected using *OneNote* to inform me as I wrote these comments. This led to some interesting conversations that were started because I realized through looking at my documentation on each student that there were domains of the report card that I had far less documentation for such as *Self-Regulation and Well-Being* or *Belonging and Contributing*. Teacher 2 hadn’t yet started using digital documentation for these areas. I realized that even though our new curriculum is one quarter literacy and math, we are so conditioned as teachers to feel that it is the most important part of the curriculum and that other learning skills are not as important to plan for or document. These conversations about the new curriculum helped me to see that I need to adjust my thinking to a less language/math focus and more of a holistic focus on the child. It gave me an opportunity to revisit the curriculum and take a longer look at those “non-academic” expectations and how I can better program in these areas for my students. This was one of the benefits of having time to reflect upon our practices through discussions with another educator.

4.3.2 Technology Instruction

Since I was also writing my literature review while doing the research for this project, my views also began to change as a result of new learning I was having from

reading research about iPad use with young learners. When I read about different types of technology instruction, I realized that I had not talked to my students about how to properly use the iPads. I had been reactive when I saw them using them incorrectly but it had never occurred to me that I needed to teach my students about how to properly interact with the devices. When I realized this, I had a discussion with my whole class. My discussion included talking about the iPod/iPad cases and why it's so important that they stay on. I explained that the cases are like helmets and they protect the devices. We also talked about the battery of the iPods/iPads and created a bin with two compartments: one for charged devices and one for ones that needed charging. This eliminated children continually coming up to me to tell me one needed charging or wasn't working.

We noticed that some students would use trial and error until they got the desired outcome on the iPad. We felt that they weren't stopping to think about the purpose of this game. I also noticed personally that I was taking for granted that kids would just know how to do things on the iPad without my instruction. An example is using the instructions at the beginning of a game such as the activities in *Bugs and Buttons*. At the beginning of each game there is a hand that shows them how to do the activity. I noticed some students were impatiently tapping the screen during this time and then did not understand the game and asked me for help. I realized that instead of assuming they should know and feeling frustrated, I needed to teach them how to interpret and follow the instructions.

4.3.3 Shifts in Educator Role from "Sage on the Stage" to "Guide on the Side"

***Teacher and student choice in learning goals and activities*.** The reason that I applied for this grant was, though I had opportunities to do professional learning communities through my school board and within my school, I often felt dissatisfied with these learning opportunities. Often even though there was an exploratory nature to them, there was a prescribed direction, whether it be focus on teaching math a certain way or whatever else was the board direction was at the time. Often I felt, especially as a kindergarten teacher, this learning was not answering the questions that I had. I wanted to know how I could improve my practice within the context of my unique situation and set of beliefs as an educator. Interestingly, this parallels our findings about what seemed to work for our students. We started out the project with the goal of observing and teaching through guided groups led by the teachers and students using apps that we had picked for time frames that we had prescribed. In our first session, we spent considerable time discussing what apps we would choose and how we would direct student learning. We continually talked about guided groups as the pathway for students to learn using the iPads.

Gradually as our time with the students and iPads increased, we allowed students more freedom to choose their learning opportunities on the iPads. By the final session, our view of how to program for students changed as we learned some valuable lessons through observing students when they were given the choice of apps. Students seemed to have different preferences when it came to activities. For some it was a race car game, others literacy and numeracy focused games, and for others it was drawing. We found that when we allowed the students to choose how they wanted to learn on the

iPads, the learning was more fruitful. Not only did they choose tasks right for their skill levels but they also showed their ability to self-regulate.

> "I think it's innate that humans learn and if, you know what I mean? They are not gonna stay on that racing game when all it is doing this over and over and over. At some point, their body is going to get bored and sick of that and that they are going to move on to something else and whether... it may not be a leap of science but they are going to be learning something else."

Just as I felt that choosing my own learning direction as an educator would give me the greatest reward, my students also showed that they learned best when given the freedom to choose how they want to do so. Another example of this is when I noticed a student on an app that he was not "supposed to" be on. And I was about to correct him when I realized that he had found an app that was at his developmental level. He had found an app that sang and displayed the alphabet and he was singing along to the song over and over. That was a perfect learning task for him.

Teacher 2 and I had different experiences with student choice because her students did not get the choice as to whether or not they wanted to use iPads. They went to that activity to it as part of a required rotation of centres. My students on the other hand got to choose whether or not they wanted to go to this centre. This allowed me to see the natural flow of students that went there and how much time they spent there. I noticed that some students were not that interested in playing with iPads and would do it only when their friends were there and for brief amounts of time or if the teacher. They seemed to go there more for the interactions with others. It was just like

other areas of play such as the construction zone where kids play with blocks. Some kids frequently participate in that area whereas other kids use it very minimally depending on their interests at the time.

> "I think for me too one of the biggest benefits has been the ability to differentiate learning so like you know, you have one kid who's really interested in the ones where you draw a picture yourself on the iPad and then there's one that wants to listen to the songs and one that wants to do this and the different levels where I think it's a really great way of kind of catering to all of their different interests, all of their different skill levels."

Teacher learning happened simultaneously as we were doing research in our classrooms and as we discussed our findings during our sessions together. For example, in one session we realized that we could add audio recording and that when audio was added, the date automatically was added. Then we discussed how we could use the audio recorder to record our own observations of children because, it is much quicker to record our own voices then to type on the iPad.

***Community of learners*.** At the beginning of the study, Teacher 2 expressed her desire to observe as kids played on the iPads.

> "It would be interesting if I could one time just pull over one of those kids who's articulate and say show me what you like to use on this and show me what game you like to play and how it works because they could probably teach me more in five minutes then me just playing on my own."

Because our focus was on learning more about iPads, she actually spent the time doing this. She realized that there were so many activities within the *Bugs and Buttons* set of

apps that we had purchased and she wanted to know how each one related to the curriculum. Because she knew she didn't have the time to go through all of them, she asked her students to go on specific activities and come back to her and tell her what the activity was and what they learned on it. Through this, she was able to discuss with the students what they were learning and students were given an opportunity to use communication skills to explain what they were learning. She also got a better understanding of what apps were helpful for students at different stages in literacy and numeracy development.

> "I'm staying away from being the expert on them and I think that's powerful for them. I think that… too many times kids are always going to the teacher for the answer. They need to start to look within themselves and persevere to find the answer."

We realized that sometimes the students knew more than we did about the apps or how to use the technology and were able to help each other.

***Minecraft and innovating*.** When my teaching partner and I discussed curriculum areas that our iPad activities were helping students to develop, we realized that the apps we had chosen were not supporting our children's development of innovation skills. We had a long discussion about using *Minecraft*. I had used *Minecraft* with my daughter from a young age and found it to be an incredible learning tool which seemed to allow children to make connections from learning on the iPads to the play the they were doing in class. I also felt like we needed some open content apps that would allow students to create their own products, especially being that some of the other apps we had chosen were more traditional, behaviourist types of teaching. I also knew

that within this app there were many different expectations that students would be exploring and that it seemed to tie in well with the new curriculum. My teaching partner was apprehensive about using Minecraft because she didn't feel that she knew enough about it but was open to the idea of trying it.

When I first introduced it, many of the students were really excited because it was a link between home and school. Some had older siblings that played *Minecraft*, their parents had Minecraft or they had seen advertisements about it. They seemed to know it was something culturally important. Students made comments like, "We have this at home!" or "We get to play *Minecraft*!"

As students started using the app there were many different levels of expertise. One student had experience playing *Minecraft* at home and knew a lot that I didn't know about it. He could help other students discover things about it. The rest of my students had not played *Minecraft* though they knew of it. Some could build things fairly quickly and for others building structures was too difficult and they needed my support to create things. I have one student who was not able to sit and play any of the other apps we had picked out because they required a lot more focus and rule following and he was just not as interested. *Minecraft*, however, caught his attention and though he could not create anything independently he enjoyed sitting with me as we created together. When it was dark, we found torches or made openings in the earth to give us light. It was a great opportunity to talk about ways to create light such as windows. The student who was familiar with *Minecraft* was also able to bring in some of the vocabulary of *Minecraft* for the various types of rocks that were used for building. Having taught many

different grades from K-8, it struck me how many science learning goals students were touching upon in this one app by playing it.

One student asked me to help him build a house. We created a large rectangle and then added blocks on top of it. He had planned where he wanted the door. This was helping him to develop spatial reasoning skills needed for geometry and spatial sense in grade one. Even the conversations that we had about how many blocks were stacked or how large they wanted their structures to be helped them to develop mathematical vocabulary such as “rectangle” or “square” in an authentic way. As we created the house it started to rain in our Minecraft world. This brought up the conversation around creating a roof and why we need a roof for shelter.

Minecraft also encouraged discussion because students were eager to show each other what they had done, and they also needed each other's help. I found that fostering a community of learners is far more powerful than me guiding everything as a teacher. This became obvious when my seven-year-old daughter came into the school and I asked her to sit with the students at the iPad table and help them with Minecraft. She is what I would call a “Minecraft Expert” and takes considerable time to study the different features of Minecraft. She, unlike me, is not intimidated by updates but embraces the new features added to the program and eagerly learns and teaches about them within her community of friends who also play Minecraft. She sat at the table for about an hour with some students who I envisioned having a lot of difficulty navigating Minecraft independently because they had a lot of difficulty doing most tasks independently.

Afterwards, I asked her about her experience. She said it was fine. I pried further, because I was dying to know how it went with one student in particular who I thought would have a lot of challenges. I asked if he was able to use the program. She told me he did really well and she taught him how to make a snowman by stacking two blocks of snow and a pumpkin on top and that if done correctly the snowman would come to life. She also told me that she taught him how to make a mooshroom cow, which is a cow that grows mushrooms out of it.

Several things struck me about this experience. The first was that I had no idea that would happen if you added those blocks together, nor would I have experimented to do that. This made me realize how little I know about Minecraft and how kids who spend hours collaborating and experimenting have developed far more expertise than I ever will.

The second thing I realized is how my idea of success playing Minecraft was so different than it was for kids. In the rare times that I play Minecraft, I build houses. And then I make sure to furnish them with a bed and a stove, etc. I make sure that I have nice big windows and an ocean view. When kids play Minecraft they have completely different goals. And for that student who could not yet make a house, making a snowman come to life was incredibly satisfying. And in that learning he was learning to follow three step instructions, which is monumental learning for that child.

Later when I sat with another student who had been at the table with my daughter I asked him if he knew how to make the snowman come to life. He said he did and went about showing me how but was puzzled when his snowman did not come to life. We went back and looked at the blocks he used and realized that he had chosen a

different white block. This highlighted the importance of reading the labels on each material to make sure it was the right one. This was a great way to develop literacy skills.

I realized that me not being at that centre and being replaced by my seven-year-old daughter was probably the best thing I could have done to support my students' learning. And that sometimes it's best if we as teachers get out of the way and let the kids lead the learning. Especially as it relates to technology.

4.4 Summary of the Findings

Through our research, our findings indicate that iPads can help students to meet goals from the Kindergarten curriculum through a play-based approach. We found that as we gave our students the space to make their own decisions about how and when to use the technology, they could demonstrate their ability to learn in all of the four frames. Ipads were a useful tool to scaffold learning to cater to many different abilities as well as to document student learning to inform instruction and as evidence of learning for report cards. Though there were some time-consuming aspects of using iPads in the learning environment, we also found that iPads saved us time and made processes more efficient in other areas such as parent communication. Through this process of teacher action-research, we used the inquiry model to identify our own learning goals, reflect upon how to meet those goals, and put actions in place to do so. As a result, we were able to observe and gain many insights into how students learn using iPads and how we can best support them as they learn.

5 Discussion

5.1 First and Second Order Barriers

In our study we experienced several first and second order barriers. The first order barriers we experienced were similar to those found in Lui et al. (2016)'s findings such as connectivity and device management issues. When given time, however, we could overcome these barriers. Our administrator encouraged technology use which may have also increased the likelihood of technology use amongst teachers. Though several studies found that technology is under-used in classrooms, especially in early childhood education settings (Wartella et al., 2013), we encountered a different situation where our kindergarten team were leaders in technology use amongst our peers. This may have been partially because I was the team leader and have been immersed in use of technology as a part of the Master's Program at UOIT for the past four years, and while Teacher 2 had less technology experience, she was very open to the new learning and experience.

5.1.1 Time

Two of the greatest second-order barriers that we encountered were time and teacher attitudes about iPads. Prior to this study, we felt that although we had the desire to learn more about how to effectively use iPads in the classroom, we had identified what Lichtman (2012) defines as "tension" in our practice.

We felt we did not have the time to explore how we could use technology in our programs. We discussed that we felt as though we had many demands on our time and had already spent considerable amounts of time working through issues with technology. This supports the findings of Flewitt et al. (2014) and Lui et al. (2016) that use of iPads in the classroom requires teachers to spend hours of their own time

preparing learning activities on iPads. Teachers in Lui et al.'s (2016) study found it challenging to find the right apps for students at so many different levels and Flewitt et al. (2014) identified that trying to plan lessons to go with the apps was an obstacle for teachers.

When we were given time to discuss our concerns and create a plan of action to meet our learning goals, we could focus more deeply on building our own knowledge as educators. Although we observed that our children were at many different levels, we felt that iPads made it easier for us to cater to students at different abilities. A reason for this difference in perspective from teachers in the previously-cited studies could be that, in their classrooms, technology and play were not combined. In a play-based model, we are not planning specific lessons related to the apps. Students are using the apps in an exploratory way and given that freedom, there are multiple opportunities for all learners. An example of this is the boy who was demonstrating early literacy skills by pretending to enter his username into the iPad or the other student who found an app independently that would help him to learn the alphabet. When we use the play-based learning model, children have multiple entry points to learning regardless of their developmental level.

5.1.2 Teacher Attitudes Towards Technology and Play

Another major obstacle that we identified was our attitudes towards technology and play. Initially we felt uncertain that student learning would occur on the iPads within a play-based model and we questioned the use of iPads as a behaviour management tool. We also had concerns about students spending too much time on iPads or playing "mindless" games that were not "educational". As was the case with educators in the

study by Flewitt et al. (2014), we felt that reading and writing were more important skills for children to be working on than digital games. At the beginning of the study we were not yet aware of the link between literacy and iPads. We did however, feel that technology instruction was important. As this was also the case in Flewitt et al.'s (2014) study, it is suggested that although teachers feel that technology instruction is important, they are not sure how to proceed forward. This may be due to uncertainty about which "traditional" practices to keep or abandon. This was demonstrated in our discussion about handwriting instruction and whether it should be taught in a kindergarten classroom as it traditionally has been. Though we felt that students in the future would be heavily reliant on digital technologies to communicate their thoughts and we were not sure of the practicality of printing instruction, we had never received any kind of direction about whether it should be a part of our classroom practices. This became increasingly confusing as the new curriculum was released because whole class practices such as printing do not fit well into a play-based learning environment. And though it seemed to us that it might be a practice of the past, we still felt external pressure to conform to traditional practices. As the kindergarten curriculum has changed it seems that many teachers are experiencing the "tensions" of this shift in teacher pedagogies. Though this project did not solve all of these problems, as the study progressed, many of our concerns about technology and young children decreased. This is consistent with the findings of Flewitt et al. (2014).

***Educators view of children*.** When our students were playing with the technology, we found that they could create learning opportunities for themselves. It wasn't always what we had set out as the learning goal, but when we adjusted our

perspective, recognizing that “all children are… competent, capable of complex thinking and rich in potential and experience” (OME, 2016a, p. 12) we realized that students found their own learning opportunities regardless of their developmental levels. We also saw that when we document learning in the four frames using OneNote on the iPad while students are playing, we began to see pedagogical shifts. Initially we felt we had to be involved in children’s activities for learning to take place. We both have over ten years of teaching experience in various grades and where directing what, how, and when students are learning is common practice. In these environments of structured academics, play was something that children did when they were finished learning tasks, if at all.

Though, I had very positive views of play-based learning and felt that I was a strong proponent of this pedagogy, I didn’t realize how I had deep-seated beliefs about my need to be involved in the learning. As I began documenting student learning using the iPad, I took on the role of the observer. The size and design of the iPad allowed me to follow the students as they played snapping pictures, writing down quotes and anecdotal notes. Teacher 2 did the same in her class and when we reflected on this process, we found that students were meeting goals in all four frames as they engaged in play. This also included play with the iPads. This came as a relief to me because though I had heard it and read it in the OME curriculum (2016a), I didn’t believe it until I had observed it for myself. It confirmed in my own belief that children do learn best through play.

When we reflected on our students’ interactions with iPads and identified areas where we needed greater understanding as educators, we were then able to better

support our students. We also began to see the positive impact of technology in kindergarten education and use the iPads more in our classrooms. This was an extremely important shift because if teachers do not have positive attitudes about technology's role in student learning, they will not use it in schools (Blackwell et al., 2013; Blackwell et al., 2014; Ertmer et al., 2012). The findings also suggest that if teachers are given time to do their own action research, their professional knowledge will increase, as will their ability to incorporate technology into their classrooms. Blackwell et al. (2013) support these findings that when teachers have professional development opportunities focused on technology use with students, they are more likely to use technology in their classrooms. As we engaged in action research, we could solve problems and gain more understanding specific to our situation. This is consistent with Brydon-Miller et al. (2003)'s definition of action research which places the power to do research in the hands of the community affected.

5.2 Play and Learning

5.2.1 Digital Play

The absence of direction in the curriculum about incorporating technology into play-based learning (OME, 2016a) could be part of the reason why, as teachers, we felt so uncertain in this area at the beginning of our study. It could also be the reason why we felt so unsure about the place of traditional practices in the classroom such as printing instruction. As we have become more and more immersed in technology as a society, we are not provided with adequate guidance as teachers explaining how to

keep up with this trend. Instead, we are basing our practices on our own views about the place of such activities within the program.

Throughout the study, I began to realize the enormous policy gap in this area as I observed our children using iPads. Little direction has been given to kindergarten teachers about teaching digital literacy skills. Though students are writing in dramatically different ways (using text predictors, collage creators and simple video creators), as kindergarten teachers we have not received direction from the OME (2016a) or our school board about how to teach students these skills. We found that as we let students play with the iPads, we found moments to discuss with students what they were learning. We also found that as we observed children during play, we could gain greater insight into their thinking. From there, we could provide specific interventions for students using SST. One of the ways this was done was by having children notice and name their learning. By giving children the opportunities to learn through digital play, we observed students' skill development across all frames of the curriculum. Rowsell and Harwood (2015) find also that how children play changes when using iPads. In contrast, our study suggests that play on iPads was very similar to play that we observed in other classroom areas such as the block or drama areas. In the study conducted by Rowsell and Harwood (2015) considerable time was spent by students looking at popular culture in digital media such as Lego, Frozen and Peppa Pig. We did not have apps with these types of themes, so that may account for the differences in the types of play observed from our students. Similar to Rowsell and Harwood (2015), our study finds that iPads expand the number of texts and types of

texts to which students are exposed. This provides opportunities for new learning for students.

5.2.2 Educator Involvement in Play

During this study we were able to reflect upon our own involvement in play with technology. Before the study began we had very little involvement with the technology in the classroom. This is consistent with the findings of Plowman and Stephen (2005) when technology was incorporated into the play environment. As noted above, many first and second order barriers get in the way of greater educator involvement. Because of our desire to become more involved at the beginning of this study, we took over control of the devices and began guided groups for students using iPads. Though in some cases we felt that controlling what the students did on the iPads seemed to get in the way of their learning, it also provided opportunities for the type of guided interaction that Plowman and Stephen (2005) outline when explaining different types of teacher involvement with technology. According to Plowman and Stephen (2005) most teachers do not have these types of interactions with students because they lack the technological skills to do so. Because we had time to explore the iPads and apps ourselves, we could facilitate guided interaction with our students.

Throughout the study, our approach to iPad instruction was a hybrid approach: a mix between reactive and guided interactions with students. Because we had the time to explore the use of iPads in our classrooms and our own practices, we could gain the knowledge we needed to overcome second-order barriers such as lack of time or knowledge. This study responds to Plowman and Stephen (2005) which indicated that although educators felt that students would benefit from this type of approach, they

were not sure how to implement it in kindergarten. This study finds that, for iPads to be effectively used in the classroom, effective teaching strategies need to be used such as SST and a hybrid approach to technology instruction. Several studies in the literature review support this finding (Bird & Edwards, 2014; Edwards, 2013; Lyons & Tredwell, 2015; McManis and Gunnewig, 2012; Schacter et al., 2016; Zaranis et al., 2013). This was also consistent with the position statement by NAEYC, and the Fred Rogers Centre that technology can be an effective learning tool for young children when learning experiences are planned intentionally with developmental abilities and student backgrounds in mind (Wartella et al., 2013). This suggests that the iPads themselves do not guarantee a positive learning experience and that intentional planning by educators is important to ensure that the learning is appropriate for young learners. This includes careful selection of apps used and intentional interventions by educators to increase student understanding.

This study is unique in that it provides insight into how educators can use technology in play-based settings, which was an area that Bird & Edwards (2014) and McManis & Gunnewig (2012) identified as needing further research.

5.2.3 Playful Teaching

One of the things we struggled with in the study, was how to change our perspective from the view that the most important learning in the curriculum is in literacy and mathematics to one that honours the whole child and focuses on development in each of the four frames. Since most studies about the effectiveness of iPads as a learning tool for young children focus on literacy and mathematics apps (Neumann, 2014), this suggests that this is an obstacle for many stakeholders including teachers,

school boards, parents, app developers, and researchers. From my experience, even though the curriculum has changed, the change in educators' instructional strategies may take longer and educators need opportunities for professional development to explore ideas about play-based learning as we did. Pui-Wah & Stimpson (2004) support this finding that even though the curriculum may have changed, deep-rooted beliefs that educators may not even be aware of can stand in their way of truly creating a play-based learning environment for students. According to Pui-Wah & Stimpson (2004), "Development of persistent inquiry and of meta-cognitive ability is a step to promote teachers' competence to face the challenges of the changing context" (p.351).

Our findings indicate that when children are given the opportunity to choose their learning activities, they demonstrate intrinsic motivation to learn. The OME (2016a) curriculum policy supports this, finding that children will naturally endeavor to develop new understandings in each of the four frames. Play supports this natural development of skills (OME, 2016a). Ceglowski (1997) finds that children define play as *self-directed activities they have chosen to participate in*. In Bergen (as cited by Ceglowski, 1997)'s spectrum classroom play, this type of discovery play results in the greatest learning for students. Our findings that play with iPads met multiple learning goals across the four frames supports this. This is also consistent with the focus in the curriculum of meeting multiple learning goals through authentic learning experiences (OME, 2016a).

One of the realizations that we had during our study is that sometimes we just need to let kids have fun without intervening in their learning to steer them towards our educational goals. Hyvonen (2011) finds that one of the features of playful teaching is

fun and enjoyment which is consistent with our findings. Bergen (2009) also supports the finding that the most important criteria of play is that it is fun.

5.3 iPad Apps

Though our students had many opportunities to learn on apps geared towards language and mathematics expectations, due to the short duration of our study and the fact that students were learning in multiple ways during play without iPads, we cannot make conclusions about whether they had growth in learning in these areas attributable to the iPads. If we were to do a baseline test on printing skills and then one at the end of the project, we would have collected this type of data but this was not the purpose of our study. Our goal was focused on observing students and examining and modifying our own practices to better support our students. Along the way however, we did make several observations about which apps students were most drawn to and the ones we felt best supported student learning. For example, gaming apps were highly motivating for our students. This was consistent with M. Neumann's (2014) findings which suggest that gaming apps are the most appealing to young children.

5.3.1 Closed vs. Open Content Apps

We used both closed and open content apps in our study and found both to be engaging for students provided opportunities to practice many skills related to the curriculum. As supported by Flewitt et al. (2014), the closed content apps we used had repetitive game formats and helped students to master certain skills. Contrary to the findings of Flewitt et al. (2014), they also helped students to build on skills in other frames such as problem solving and communication while they played. Through our observations and discussions with students, we found that open-content apps seemed

to develop many skills at one time, and facilitate deeper student engagement with the curriculum. These included *Magnet Letters, Minecraft* and *PicCollage*. This could be attributed to the fact that students are able to personalize content (Flewitt et al., 2014) and educators are able have more input to create a learning task most suitable for the child. This could be done by altering the content of the app, giving feedback or suggestions to students about how to use the app, or modelling new ways of using it. As opposed to a short game, these apps also allowed for longer periods of interaction with the app content. For example, some students using *Minecraft* spent periods of 45 minutes interacting within their virtual world. During this time, they were often discussing how things worked with peers, trying to make meaning of the different aspects of the game, interacting with their surroundings, altering their surroundings, observing natural phenomenon within the game (such as when you add fire to wood it burns), and following the directions of their peers. This is just a portion of the rich learning that I observed as children interacted with this app. Though both open- and closed-content apps were enjoyed by students, our data suggest that open-content apps allowed for richer learning experiences.

5.3.2 Student Interaction with the Apps

Though the research in the literature review suggests that iPads increase student motivation (Flewitt et al., 2014; Kucirkova et al., 2014; Wells et al., 2016) and our students appeared to enjoy using iPads, we could not say whether students were more motivated to use iPads than other learning activities. Again, being a play-based learning environment, students are highly motivated to do various activities because they are given the freedom to choose their learning tasks. In another type of learning

environment where children are required to do certain tasks, iPads may be more engaging than traditional tasks. This may be the reason for the difference in findings.

Similar to Beschorner and Hutchison (2013) and Flewitt et al. (2014), we found that, as the study progressed, more skilled students began to take the lead, teaching the teachers and students how to use iPads. As they were using the iPads it was an opportunity for discussions with peers and educators. This further supported the shift from the teacher as the holder of knowledge to the creation of a community of learners that King (1993) describes. Students also demonstrated that they could choose apps that they were interested in and which were at their developmental levels. Further to that, they demonstrated the ability to self-regulate by switching from a more challenging activity to a less challenging one, or taking a break and leaving the iPads to play at another area of the classroom. As teachers, we found multiple instances where iPads helped students to regulate their behaviours. Though many of these seemed to have positive outcomes, Radesky, Schumacher & Zuckerman (2015) caution that this is an area where future research is needed to determine the effects of using iPads and other devices to distract students from upsetting situations. It is suggested from our research that students that kindergarten students who need one-on-one support are not yet able to regulate behaviours with or without an iPad.

5.3.3 Apps for Communication with Guardians

IPads also provided an opportunity to strengthen the home-school connection using *Remind* to communicate with parents. This also allowed for novel ways to communicate with parents such as sending home photographs of their child at play in the classroom. Beschorner & Hutchison (2013) and Lui et al. (2016) find that

technology provides greater communication opportunities which is consistent with our research findings. A possible reason for this could be that it allows for quick, seamless communication that is responsive to how parents in our community communicate on their phones. Because as a teacher, I have so many demands, finding a faster, easier way to communicate allowed for increased frequency of communication with parents. This study suggests that over time, use of communication apps like *Remind* could result in more frequent communication and possibly a stronger home/school connection.

6 Conclusion

6.1 Summary

Our study finds that when teachers are engaged in action research using the inquiry model (Timperley, 2010), they are able to engage in professional learning that supports iPad use in the classroom. Through this approach we observed that during play with iPads students were demonstrating learning in all four frames of the new curriculum. We also found that our own language and mathematics-centred beliefs and teacher-centred pedagogies were, at times, getting in the way of student learning. As we began to focus on learning in all four frames and give students greater choice in learning activities, we realized that their opportunities to develop skills increased. We also found that, through taking on the role of an observer and documenter using the digital student porfolios on the iPad, rich learning was happening in all four frames during play on a fairly consistent basis. We began to give students more freedom to choose their own learning opportunities on the iPads, and we were also responsive to

opportunities to encourage students to extend their learning and build new understandings using a hybrid interaction model where educators provide a mix of guided and reactive instruction (Plowman and Stephen, 2005).

There is so much to be learned about teaching with technology and the ways in which we use technology seems to change too quickly. As we engaged in this project, we realized that to embrace this change, we need to let go of our role as "sage on the stage" (Timperley, 2010) and allow students to lead the way. Rowsell and Harwood (2015) explain it in this way,

> Witnessing a child or children engaged in unmitigated creativity among tablets and smart phones and the stuff more generally that consumes them, makes it clear that something quite different is in play that we have yet to fully understand. It is about consumption. It is about production. It is about thinking across material and immaterial texts. It draws on touch, movement, and gesture. Young children are dynamically interpreting the world around them on a daily basis, making and remaking texts, blending and converging texts as active producers, consumers, and inventors. As educators and people who think about education, it is about sitting back, letting it go, and radically changing our ways of teaching and learning. (p.145)

6.2 Educational Implications

According to Orlikowski (1992)'s Duality of Technology Theory, the changes to teacher attitudes and practices that occur through teachers participating in action research can result in changes to larger organizational structures. This can be seen in

many kindergarten classrooms as teachers in this specialized environment increase their professional knowledge and develop new pedagogical understandings about play-based learning and incorporate these in their practices. As many kindergarten teachers lead the way in the shift from teacher-centred to student-centred classrooms, they can educate parents, co-workers and administration about how young children learn through play. In addition, as educators explore this area of play-based learning with technology, it will help to inform others about how young children learn with technology.

Currently, there is a gap in research about how to use technology within a play-based pedagogy. This leaves teachers unsure about how to proceed forward. There is also a policy gap. In order to respond to the growing use of digital devices, OME, school boards, and principals need to provide teachers with clear direction about how to incorporate a play-based program into their classroom and how to use technology as part of their programs. As Blackwell et al. (2014) point out, increasing spending on technology will be futile unless teachers are provided with adequate training and support to use the technology in the most effective ways with their students.

6.3 Future Research

It became apparent during this study that, although the first draft of the curriculum was released in 2010 (OME, 2010), describing play as the primary vehicle through which children learn, kindergarten teachers may not be clear about what that means (Ceglowski, 1997; Pui-Wah & Stimpson, 2004). Play is a complex process and a very broad term that can be used loosely to mean many different things. Bergen's spectrum of play (as cited by Ceglowski, 1997) shows that "play" in classrooms can range from drill-repetitive practice on computers disguised as fun and other rote learning to guided

play and discovery play. As we found in our study, which was also supported by Pui-Wah & Stimpson (2004), though the curriculum has shifted to a play-based pedagogy, teachers may still be resistant to changing their own practices. In our case, we were unaware of how we were getting in the way of student self-direction and choice in learning.

As suggested by Pui-Wah & Stimpson (2004), teachers need support to develop inquiry approaches to their own practice and be willing to change and evolve. Although studies indicate that technology is under-used in kindergarten classrooms (Blackwell et al., 2013), in our study we find that iPads enhanced the play-based learning environment in kindergarten classrooms and provided multiple opportunities for students to demonstrate their learning in each of the four frames. It also became apparent that iPads provide students with the types of literacy opportunities that they will need to succeed in the future. For teachers to effectively use iPads in a play-based setting, they need to have time to conduct their own action research and discuss their findings with other teachers. In addition, further research needs to be conducted about how young children learn with iPads and how teachers can best support this in their classrooms. This should include how children learn early literacy skills using iPads and how teachers can support this learning and well as further research about self-regulation skills and iPad use. Teachers need resources to support students in all four frames of the kindergarten curriculum, not just language and mathematics.

As demonstrated in our study, iPads can be used in kindergarten settings to help students develop skills in all four frames of the Ontario Kindergarten Curriculum (OME, 2016a) particularly when there is a positive teacher disposition to the use of the iPads

for student learning and assessment, and when teachers are given the time, space, and resources to explore technology on their own.

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9 Appendices

9.1 Appendix A – Teacher Consent

Letter of Invitation - Participant in the research project entitled: “Investigating how educators can integrate iPads to meet Early Learning Kindergarten goals across domains”

Dear Participant,

I am inviting you to participate in an action research project where two educators (myself and you) regularly review and report on teacher practice with the use of Ipads in the classroom.

I am a Master’s student at the UOIT Faculty of Education. With the approval of the UOIT Ethics Board (REB #14104) and the DDSB External Research Committee, I am conducting a study about how we as teachers can use iPads to meet multiple learning goals in a Kindergarten classroom. This study will take place during the 2016 fall and winter semesters. Direct benefits to participants involved in this project include the time to reflect upon using iPads in their classroom to improve pedagogical practices. This research is beneficial to teachers because although iPads are available for use with Kindergarten students, more research needs to be done addressing how they can be used more effectively in all areas of the kindergarten curriculum in addition to literacy and numeracy. I believe that this research will address a gap in this area.

As we participate in the Teacher Learning Co-op Project from Ontario College of Teachers which we jointly applied for last spring, I will be conducting research about how we are using iPads in our classroom and our learning throughout the program. Research results will be reported in my Master’s Research Project report and it may also be published in journals and presented at conferences.

I am inviting you to participate in this study with me. Data will be collected from our conversations during meetings held at regular intervals throughout the 2016-2017 school year. Your comments will only be included if you have consented to this research. Participation in this research is entirely optional. I am proposing that we record our conversations and I will transcribe them. You will have an opportunity to review a transcript of our meetings and revise any of your contributions I will provide you, as the participant, a copy of the transcribed notes within a week of our meeting.

You may withdraw from the study at any time without penalty up until the Master’s research report is being written at the conclusion of the study. If, during any of the above described activities, you decide not to participate, you can terminate involvement in the activity by approaching the researcher and indicating that you wish to withdraw from the study. The information you provide will not be stored with personal identifiers, nor will you be identified in any recorded or published comments. If a name is used in the reporting, it will be a pseudonym. The tapes and transcripts of meeting proceedings, as well as any other data collected will be stored on a jump drive in a locked drawer in my office. I will not store the data on my computer. My research supervisor has access to the data from this study and will follow the same protocols (storing data on a secure drive in a locked drawer in a secure location). By consenting to participate, you do not waive any legal rights or recourse.

Your signature on the consent form indicates that you have read this letter, understand its contents, and consent to participating in this research project.

If you have any questions concerning the research study please contact the researcher Lisa Tsumura @ lisatsumura@me.com. If you experience any discomfort related to the study, please contact the researcher’s supervisor, Dr. Lorayne Robertson @ Lorayne.robertson@uoit.ca.

Any questions regarding your rights as a participant, complaints or adverse events may be addressed to Research Ethics Board through the Ethics and Compliance Officer – researchethics@uoit.ca or 905.721.8668 x. 3693."

This study has been approved by the UOIT Research Ethics Board REB 14104 on November 28, 2016.

Thank you for considering participation in this research study.

Lisa Tsumura
UOIT M.Ed Student

CONSENT FORM: Please sign and return to Lisa Tsumura, Student Investigator

I have read the Letter of Invitation relating to **Investigating how educators can integrate iPads to meet Early Learning Kindergarten goals across domains.**

I understand the proposed research and my questions have been answered to my satisfaction.

I understand that information collected is for research purposes only. I understand that I have the right to withdraw from the study at any time until the Master's report is written.

By signing below, I consent to participate in the research study.

Name (please print): _____

Signature: _____

Date: _____

9.2 Appendix B – Student Consent

UNIVERSITY OF ONTARIO INSTITUTE OF TECHNOLOGY | FACULTY OF EDUCATION

November 21, 2016

Title of Research Project: Investigating how educators can integrate iPads to meet Early Learning

Kindergarten goals across domains

Dear Parent(s)/Guardian(s),
Mrs. XXX and I received a grant from Ontario Teachers Federation to take part in a study where we look at how teachers plan and use iPads in the classroom to help children meet Kindergarten early learning goals. We received some money to buy iPads to use in our classrooms. Mrs. XXX and I will meet several times throughout the year to talk about our teaching plans for this project. These discussions will include how we are using the iPads in the classroom, some general observations about how students are using them, and how we can improve our practice as educators.

I will be writing a report for my research as a Master's of Education student at the University of Ontario Institute of Technology (UOIT) about our findings. This research has been approved by the UOIT Research Ethics Board (REB #14104) and the Durham District School Board External Research Board (Research Proposal 17-006) and I will be supervised by Dr. Lorayne Robertson in the Faculty of Education at UOIT, lorayne.robertson@uoit.ca

Our discussions between teachers will be recorded and used for data in my research report but no student names will be used. Your child's privacy will be protected. No student's name or the name of the school will be included in this study report. This study will be completely confidential. In addition, if you do not feel comfortable with observations of your child being included in our discussions, we will not discuss observations of your child during these meetings. Also, you have the right at any time to withdraw your consent for your child to work with the iPads project and no questions will be asked. To withdraw your child, just send an email to me, Ms. Tsumura lisa.tsumura@ddsb.ca.

We believe that this project will benefit the children because they will have a chance to explore with the iPads. It will also benefit the teachers to learn more about how children use iPads for learning and communication. If you have any questions about this study, please feel free to contact me, Ms. Tsumura, at lisa.tsumura@ddsb.ca or my faculty supervisor at lorayne.robertson@uoit.ca. Additionally if you have any questions regarding this research study or about your rights, please contact the Ethics and Compliance Coordinator at 905 721 8668 ext. 3693 or researchethics@uoit.ca.

At the end of the year we will write a report about the study for the Ontario Teachers Federation and send a summary for the parents.

Thank you,

Ms. Tsumura

PLEASE SIGN AND RETURN THE CONSENT FORM ON THE NEXT PAGE- THANK-YOU!
Written Consent: Date: November 25, 2016

☐ I have read the consent form and understand the study being described.

☐ I have had a chance to ask questions and have them answered. I know I can ask questions in the future if I need to.

☐ I freely consent to my child participating in this research and understand that she or he will not be a part of this study if I change my mind.

A copy of this consent form will be made available to me.

Child's name: _____

Name of parent: (please print) _____

Parent signature: (please sign) _____

Signature of the researcher:

_____
Ms. Tsumura

9.3 Appendix C – Interview Questions

Research Question: How can teachers use iPads to meet Early Learning Kindergarten curriculum goals across domains?

Session 1 - Discussion Questions (for both myself and my teaching partner)

1. How are you/we currently using iPads in your classroom? This includes:

a. Types of apps
b. Student grouping for use - whole class, individual, small group
c. Instructional methods - guided, whole class, individual, as review or to teach content

2. What is your area of focus for this project about how iPads can be used to meet ELK curriculum goals across domains? Why did you choose this particular area of focus?
3. What curriculum expectations did you first decide to focus on?
4. What of the applications will best serve your purposes? Why?
5. What instructional strategies will you/we use to achieve our goals?
6. How might we know if iPad use is improving students' ability to meet learning goals?What will be some of our indicators
7. What assessment strategies do you think we will use?

Synthesis question: In your view, how did the technology affect the learning of the students? (Positive and negative implications.)

Session 2 (and subsequent sessions)- Discussion Questions

1. Let's look over our discussion from the previous session and see if any ideas from previously come to mind as key discussion points this time.
2. Did you/we use the iPads? How often?
3. Specifically, can you explain how we/you used the iPads to meet ELK goals?
4. What curriculum areas did you/we focus on?
5. In your/my view, what some of the strengths/weaknesses of these different approaches?
6. In your/our view, what evidence did we/you see that the use of the iPads increased student engagement and/or achievement?
7. What instructional strategies did you/we use with iPads and the selected apps and how did you know that they were effective were they effective?
8. Were there new approaches or novel ways that you/we used iPads to meet the learning goals of the JK/SK curriculum?

Synthesis question: In your view, how did the technology affect the learning of the students? (Positive and negative implications.)